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MARKET FOR ELECTRICAL EQUIPMENT

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Trade Promotion Series—No. 101

MARKET FOR ELECTRICAL EQUIPMENT IN THE UNION OF SOUTH AFRICA

BY

EDWARD B. LAWSON
Assistant Trade Commissioner, Johannesburg

UNITED STATES
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FOREWORD

The Union of South Africa, although not a world market of the first magnitude in the field of electrical equipment, is nevertheless one that is relatively well developed in proportion to its population. Progressively through its history, from the time of its occupation by the Dutch in 1652 to the establishment of the political Union in 1910 and its ultimate acquirement of Dominion status in the British Empire, it has been developing as a market for various commodities characteristic of modern living standards, and to-day is being intensively cultivated by oversea producers.

Our electrical exports to British South Africa have grown steadily since the close of the World War. The total shipments of electrical goods to the Union and other British territories in South Africa from 1922 to 1929 were as follows:

1922	$536,156	1926	$1,408,943
1923	972,422	1927	1,557,776
1924	1,395,997	1928	1,706,378
1925	1,901,503	1929	1,966,586

Prior to 1928, United States statistics did not differentiate the Union from other British South Africa. In that year, however, the separate figures show that $1,674,917 worth, or 98.2 per cent, of our electrical-equipment exports to British South Africa was consigned to the Union; in 1929 this share expanded to $1,960,524, or 99.8 per cent.

Exporters desiring to sell electrical equipment in the South African markets will find in this bulletin all the data concerning that market which is in the electrical equipment division in Washington, together with the results of a thorough local study of the situation in South Africa. On these two bases, the following report, embodying a wealth of detail gathered on the ground, was prepared by Assistant Trade Commissioner Edward B. Lawson, at Johannesburg.

Requests for additional information regarding electrical developments in this area or for information concerning other foreign markets will be given prompt attention by the electrical equipment division of this bureau. Interested firms are referred to the selected list of bureau publications given at the end of this bulletin and are urged to take advantage of these facilities for furthering their business abroad.

WILLIAM L. COOPER, *Director,*
Bureau of Foreign and Domestic Commerce.

JULY, 1930.

MARKET FOR ELECTRICAL EQUIPMENT IN THE UNION OF SOUTH AFRICA

INTRODUCTION

The union of the four colonies—the Transvaal, the Orange Free State, Natal, and the Cape of Good Hope—combined to create a political entity and a Dominion, within the extended boundaries of which are some 471,917 square miles of territory. Widely separated cities, long stretches of sparsely settled veld, a scattered farming element, and clustered groups of native tribes combine to give the country a total population estimated in 1928 at 7,777,583,[1] or about 16 to the square mile. Basutoland and Swaziland, appearing on the map as land-bounded islands in the Union, are not member Provinces with the four mentioned, but are administered by Great Britain.

There are considerably fewer whites than natives, only 1,738,937 [1] being represented among the total population of almost 8.000,000. The preponderant number of non-Europeans (6,038,646 in 1928 [1]) as compared with those of European extraction, precludes the use of the total as a true population figure in analyzing the market for electrical equipment used in modern standards of living.

According to the latest estimates [1] the population is divided among the four Provinces, as follows:

ESTIMATED DENSITY OF WHITE POPULATION IN THE UNION OF SOUTH AFRICA, 1923

Province	White population (number)	Area (square miles)
Cape Colony	728, 159	276, 536
Natal	167, 667	35, 284
Transvaal	634, 411	110, 450
Orange Free State	208, 700	49, 647
Total	1, 738, 937	471, 917

The census of 1926 places nearly 42 per cent of the white population of the Union in the rural districts, or about 701,425 persons, whereas only 975,235 are classed as urban dwellers. Of this latter class, many reside in very small towns or dorps under conditions scarcely differing from those prevailing in the rural areas.

[1] The last general census was taken in 1921; but in 1926 a quinquennial census of the white population only gave returns of 1,676,610 for the Union. On this basis and on the 1921 figures for non-Europeans, the above figures of population for 1928 have been estimated and published in the "Official yearbook of the Union of South Africa" for 1927–28.

In 1927 there were only 13 cities having a white population of 10,000 or more.

In measuring the potentialities of the market for electrical machinery, equipment, and household appliances, it must be constantly remembered that the demand for current and service and the sales of commodities are distinctly limited by the relatively small white population and by the substantial part of that population residing in rural sections where electric service is not available. In the larger urban centers living standards are, on the average, comparable with those in many countries but are not so high as in the United States. These conditions have a direct bearing on the domestic demand for service and equipment, as well as an indirect influence on industrial demands.

SOURCES OF ELECTRIC-CURRENT SUPPLY

The Union has made relatively good progress in electric-power provisions and in the extension of service to various centers for power and lighting purposes in response to the industrial progress and the increasing demand from municipalities. According to the latest available statistics covering the census for the year 1926–27, there were 147 electric light and power plants (central stations—including Government, railway, shop, and municipal undertakings) in the Union, an increase of 13 during the postwar years. These plants employed 8,009 persons and "Machinery, plant, and tools" valued at £16,727,000 ($81,402,000) to produce electric current valued at £4,915,000 ($23,919,000).

MUNICIPAL UNDERTAKINGS

During the past two years municipal undertakings have developed rapidly under the stimulus of sympathetic officials and growing demands. The general advance in electrical power-plant construction and enlargement not only indicates a consciousness and appreciation of community benefits from plentiful power supplies but serves to encourage the establishment of industrial pursuits within the radius of municipalities affording such facilities; at the moment intercity competition in the matter of industrial development is very keen.

Evidence of the active development in public electricity-supply undertakings is shown in the 126 recorded in 1928, as compared with the 111 in 1927. The detailed records of those undertakings show not only this considerable expansion but also a number of existing undertakings that have been or are to be scrapped and new stations laid down. In addition, efforts are being made so to equip plants with modern and efficient apparatus that current can be offered at rates that will greatly stimulate its consumption by both householders and industries.

The following list of those towns in South Africa that have a population of 10,000 or over and that are served by public electricity supplies will afford some index to the general character and extent of public facilities in the principal centers of the Union.

ELECTRIC SUPPLY PLANTS IN CITIES OF MORE THAN 10,000 IN THE UNION OF SOUTH AFRICA

City	Installed capacity (kilowatts)	Phase [1]	Voltages	
			Lighting	Small power
Benoni	710	3	220	380
Bloemfontein	6,000	3	200	347
		Direct.		
Bulawayo	2,200	3	230	400
Cape Town	31,900	3	220	380
		2		
		Direct.	220	440
Durban	26,000	3	100/220	100/220
		Direct.		
East London	3,800	3	220	380
		Direct.		
Germiston	1,600	3	120	200
Johannesburg	39,000	Direct.	230	460
		2	200	[2] 400
		3		
Kimberley	1,260	3	220	220
Krugersdorp	320	3	240	240/420
Malmesbury	200	Direct.	220	220/440
Oudshoorn	365	Direct.	220	220/440
Pietermaritzburg	3,840	3	220	200/500
Port Elizabeth	9,500	3	[3] 250/110	[2] 250
		Direct.		250/500
		Direct.	240	250/500
Potshefstroom	545	3	220	380
Pretoria	18,000	3	250	430
Rustenburg	250	3	240	416
Salisbury	600	3	240	440
		Direct.	220	220/440
Uitenhage	345	Direct.	220	440
Windhoek	200	Direct.	220	440

[1] Alternating current (50 cycles), except where noted. [2] Single phase. [3] 110-volt area is Humewood

LOCAL CHARACTERISTICS

Throughout South Africa there is a wide variation in characteristics, lighting voltages ranging from 100 to 250, though 220 volts is the more common; within this range, seven central stations supply 110-volt and two supply 115-volt current. For small power the variation is much greater, ranging from 100 to 500 volts, with only a small fraction of the total number of stations fixing on any one voltage. Many of the larger cities have both direct and alternating current; the others are divided about equally between alternating and direct. The frequency of nearly all alternating-current plants is 50 cycles, though a few employ 25 and 60 cycles.

DURBAN

Efforts to develop the domestic load in the municipal area of Durban have been especially pressed during the past two or three years, with a fair degree of success; the per capita consumption in that town exceeds that in other large centers. A considerable amount of the power sold has been derived from pass-out turbines installed in a sugar factory where larger quantities of heating steam are required.

During 1928 the new Congella station, containing now two 12,000-kilowatt units, was completed and put into commercial operation. It is reported to be the first pulverized-fuel power station erected in South Africa, and the critical eyes of power engineers are focused on its operation. The entire project has been designed to permit increase in generating capacity, not only for the growing general and indus-

trial demand in the Durban area, but also for the traction requirements of the Railway Administration, should it decide to proceed with the electrification of that section of the line between Pietermaritzburg and Durban; however, the latest report of the Manager of Railways and Harbours apparently does not favor the carrying out of that plan at this time. The Durban Corporation has agreed to take a bulk supply of 60,000,000 kilowatt-hours per year.

OTHER CENTERS

Johannesburg is proceeding with a second 10,000-kilowatt set at the new Jeppe Street station.

Cape Town has shown an unusually high percentage of increase in output during the past two years, and an extensive rural network of supply channels is being established.

Pretoria is laying down a 7,500-kilowatt unit.

At Port Elizabeth a 3,000-kilowatt set, previously operating in Durban, is being erected and it is reported that it will be supplemented soon by a new plant.

Rumors indicate that East London will install a 3,000-kilowatt turbo-alternator during the coming year.

These and other proposed developments predict a further increase in current consumption in South Africa, although the marked activity in establishing power facilities recently is likely to be followed by a few large undertakings.

INCREASE IN CURRENT GENERATED

On the whole there has been a consistent increase in the amount of electric current generated in the Union. In 1898 the total number of kilowatt-hours generated (both direct and alternating current) amounted to 1,893,269,029, an increase of 197,467,400 over the 1927 figure. Alternating-current consumption has shown the more consistent gains on the part of all users, as will be noted in the following table:

ELECTRIC POWER SUPPLIED IN THE UNION OF SOUTH AFRICA,[1] 1926–1928

[In kilowatt-hours]

Supplied for—	1926	1927	1928
DIRECT CURRENT			
Mining	3,640,822	2,525,572	2,417,842
Industrial and private users	43,968,170	42,431,060	46,129,573
Municipal, railway, and power stations	10,919,148	103,638,633	136,410,406
Tramways	37,655,595	35,743,600	38,140,715
Loss in distribution	5,812,543	11,131,258	8,022,018
Total	[2] 101,996,278	[2] 195,470,123	[2] 231,120,854
ALTERNATING CURRENT			
Mining	982,360,371	1,033,326,693	[3] 1,118,873,720
Industrial and private users	149,202,853	178,546,343	242,209,853
Municipal, railway, and power stations	108,396,233	144,767,603	152,980,409
Tramways			
Loss in distribution	124,759,933	143,690,867	148,084,493
Total	1,364,719,390	1,500,331,506	1,662,148,475
Grand total generated	1,466,715,668	1,695,801,629	1,893,269,029

[1] From "Annual Report of the Government Mining Engineer, 1928."
[2] Including the alternating-current units converted to direct-current and not included in "Alternating-current" figures.
[3] Including 37,567,209 alternating-current units used in the production of compressed air.

Although the percentage of increase in total units generated is higher under the direct-current classification, the phenomenally large increase in consumption by "Municipal, railway, and power stations," almost accounts for the actual gains of this entire group in 1928, as the mines registered a falling off in consumption of direct current.

ELECTRICITY SUPPLY COMMISSION

The importance of ample supplies of electricity, especially for industrial and other undertakings, was recognized by the authorities several years ago when the electricity act of 1922 was passed, and progress in the establishment of sources of electric power has increased as well as capacities of existing plants. By virtue of that act, the regulation of electric-power projects is more or less centered in two Government bodies, the Electricity Supply Commission and the Electricity Control Board.

The act provided for the appointment of a commission of three to five members to establish, acquire, maintain, and work undertakings for efficient and cheap supply of electricity in the Union, and to investigate new or additional facilities for that supply. The powers of the commission are wide, and include the appointment of officers, the purchase or sale of plant and property, the purchase or sale of coal, steam, water, and other materials and stores, and the manufacture and sale of by-products. The act further provides for the appointment of a board to control the supply of electricity by the commission or by any private undertaking.

COMMISSION UNDERTAKINGS

The Electricity Supply Commission commenced its activities in March, 1923, and since that date a number of electrical undertakings were made the subject of investigation by the commission, which has had in view from the outset the possibility of assisting industries by means of cheap power.

In consultation with the other interests concerned, the commission entered into the following undertakings:

1. Erection of a power station (capacity 60,000 kilowatts maximum continuous rating) in the Witbank area, at an estimated capital cost of £1,079,500; to be built and operated by the Victoria Falls & Transvaal Power Co. (Ltd.), for and on behalf of the commission.
2. Establishment of an electrical undertaking (capacity 30,000 kilowatts) at Cape Town, primarily to supply the power required for the proposed electric working of the Cape Peninsula suburban railways, but also to serve the whole of the Cape industrial area. The estimated capital expenditure for which the commission is responsible is £977,500.
3. Acquisition of the Colenso power station (capacity 60,000 kilowatts), the 88,000-volt transmission lines, and the substations erected by the South African Railways Administration in connection with the electrification of the Natal main line of railway between Glencoe Junction and Pietermaritzburg.
4. Erection of a power station in the Durban area, to supply power to the Durban Corporation and ultimately to be linked up with any electrical undertaking necessitated by the proposed extension of the electrification scheme of the Durban-Pietermaritzburg Railway line.
5. Provision of a hydroelectric power scheme in the Sabie area, northern Transvaal, in the interests of the numerous small mining concerns in that area.

Under the electricity act the commission is required to report on any proposals by a municipality for the establishment of a new electricity undertaking or for the enlargement of an existing scheme to an extent exceeding, within a period of 12 months, 10 per cent of its existing rated generating capacity. Up to December, 1926, the commission had reported on 66 such municipal schemes.

The latest report of the Electricity Supply Commission (June 30, 1929, covering the year ended December 31, 1928) shows the capacities of its undertakings, as follows: Natal central (Colenso station), a generating set of 66,600 kilovolt-amperes; Witbank, 94,000; Cape Town, 33,300; Durban, 45,000; and Sabie, 1,800; a total of 240,700 kilovolt-amperes. (The fourth 20,000-kilowatt turbo-alternator at the Witbank station was started up in May, 1929, and a fifth is now on order, thus bringing the capacity of the main generating sets at that station up to 100,000 kilowatts, or 117,500 kilovolt-amperes.)

NATAL CENTRAL

The Natal central undertaking consists of: (*a*) A power station at Colenso comprising five main generating sets of 12,000 kilowatts each (a total installation of 60,000 kilowatts) and 10 boilers, each of a normal capacity of 60,000 pounds of steam per hour; (*b*) 275 miles of 88,000-volt overhead transmission lines extending in duplicate from the power station in a northerly direction to Glencoe Junction, and in a southerly direction to Pietermaritzburg; (*c*) a step-up substation at Colenso and 12 substations at intermediate points between Glencoe Junction and Pietermaritzburg, for distributing electricity and for converting alternating to direct current for railway-traction purposes; and (*d*) local transmission and distribution systems, and other miscellaneous buildings and appurtenances.

The Colenso power station during 1928 generated 128,175,490 kilowatt-hours and sent out from the station 119,521,770 kilowatt-hours. The maximum demand (30-minute period) was 27,060 kilowatts. The yearly load factor was 50.28 per cent. The thermal efficiency of the power station was 17.84 per cent—an improvement over 1927. The violent fluctuations in the demand on the Colenso power station, caused by variations in the railway traction load, may be gathered from the fact that, although the maximum half-hourly demand at the power station during 1928 was 27,060 kilowatts, the maximum two-minute demand on the generators was 36,000 kilowatts with peaks of over 38,000 kilowatts.

WITBANK CENTRAL

The Witbank undertaking consists of: (*a*) A power station at Witbank, comprising four main generating sets of 20,000 kilowatts each (a total installation of 80,000 kilowatts) and 15 boilers, each of a normal capacity of 70,000 pounds of steam per hour; (*b*) a 21,000-volt reticulation system for transmitting electricity to the commission's consumers in the Witbank district; (*c*) a 2,200/380/220-volt transmission and distribution system within the Witbank municipal area, for the supply of electricity to consumers and for street lighting within the township; and (*d*) other miscellaneous buildings, works, and appurtenances.

The Witbank power station is interconnected with the power supply system of the Victoria Falls & Transvaal Power Co. (Ltd.), on the Witwatersrand, by means of a 132,000-volt overhead transmission line between Witbank and Brakpan, owned and operated by that company.

The Witbank station during 1928 generated 491,030,570 kilowatt-hours. The maximum hourly demand was 61,899 kilowatts. The load factor was 85.37 per cent. The thermal efficiency of the station was 17.63 per cent—a slight improvement over 1927.

CAPE TOWN CENTRAL

The Cape Town undertaking comprises: (*a*) A power station at Salt River, consisting of 3 main generating sets of 10,000 kilowatts each (a total installation of 30,000 kilowatts) and 4 boilers, each of a normal capacity of 60,000 pounds of steam per hour; (*b*) a step-up substation at the power-station site, and rotary converter substations at Three Anchor Bay, Milnerton Junction, Claremont, Diep River, Muizenberg, and Glencairn; (*c*) duplicate 12,000-volt underground cables connecting Salt River power station with the Dock Road power station, belonging to the Cape Town Corporation, and with the Three Anchor Bay and Milnerton Junction substations; (*d*) a 33,000-volt underground cable and a 33,000-volt overhead line (the latter, belonging to the Railway Administration, carried on the track structures between Salt River and Muizenberg) connecting the step-up substation with the substations at Claremont, Diep River, and Muizenberg, also duplicate 33,000-volt underground cables between Muizenberg and Glencairn substations; (*e*) a 12,000-volt underground cable system serving Table Bay Docks; (*f*) a distribution system, consisting of 92 miles of 33,000-volt distribution lines with substations, in the Cape rural area; and (*g*) other miscellaneous buildings and appurtenances.

The kilowatt-hours generated at the Salt River power station from February, 1928, when the station was started, to the end of that year totaled 29,080,875. From July, when continuous operation of the station had commenced, to December, 1928, the generated total was 26,105,685 kilowatt-hours. During the latter period the units sent out from the power station totaled 24,525,558 kilowatt-hours. The maximum demand (30-minute period) was 14,540 kilowatts. The yearly load factor was 38 per cent.

The commission also maintains a 33,000-volt distribution system in the rural area outside the Cape Peninsula. The load on this system is rapidly increasing. The units sold during 1928 total 9,767,699 kilowatt-hours as compared with 4,690,009 sold during the previous year, several of the larger consumers having been connected up toward the end of that year. Several extensions of the system to supply new consumers and to afford alternative means of transmitting the supply between various points on the system are in hand. The extension of transmission lines in this area has gradually brought new consumers within economic range of the system and, with the potential developments in sight, it is anticipated that within the next few years sales in this area will reach about 15,000,000 kilowatt-hours per annum.

DURBAN CENTRAL

The Durban undertaking consists of a power station at Congella, which will have an installation of 36,000 kilowatts in 4 main generating sets—2 of 12,000 kilowatts each and 2 of 6,000 kilowatts each—together with 6 boilers, each of a normal capacity of 60,000 pounds of steam per hour; the boilers are fired entirely by pulverized coal.

The Congella power station has been so built as to be capable of easy and inexpensive extension; for example, accommodation is available in the boiler house for two additional boilers, and the engine room is large enough to accommodate five main generating sets. Provision has also been made in the circulating waterworks for handling a quantity of water considerably in excess of immediate requirements.

POWER

WATER POWER

South Africa is not blessed with a plentiful supply of water power, one of the outstanding deficiencies of the country being the lack of water. Relatively few streams of any size are available for hydroelectric projects of importance, nor does the limited rainfall over large stretches of the country contribute to the possibilities of water-power development.

South Africa is mainly a high plateau, drained by the Orange and Limpopo River systems. The Orange River rises in Basutoland and flows generally westward to the Atlantic Ocean. It has several tributaries, mainly from the north, the most important being the Vaal. This system drains most of the southern part of the Union, or nearly half of the total area. The Limpopo Basin adjoins the eastern part of this area, with the Bechuanaland Protectorate, Transvaal, and Southern Rhodesia as its watershed. It flows eastward through Mozambique (Portuguese East Africa) into the Indian Ocean.

South West Africa mandate is dry, a large part of the Kalahari Desert lying in this territory and the remainder in the Bechuanaland Protectorate.

The total fall of the longer rivers varies from 1,000 to 2,000 feet, usually concentrated in a short length of the river. The average fall of the 800-mile-long Vaal River is about 2.5 feet per mile. The Orange River has about the same average fall; from Uppington, Cape Colony, for a distance of some 60 miles, it drops rapidly and then again follows a flat course to the ocean. The Tugela River, in northern Natal, is the most important of those streams flowing to the ocean on the east coast; those flowing to the south are chiefly the Berg, Breede, Gouritz, Gamtoos, and Sundays Rivers.

A number of investigations of water-power schemes for the Union have been made, but relatively few have been found practical for sizeable projects. The Electricity Supply Commission had under consideration for several years a proposal for a hydroelectric scheme at Gordons Bay, using the surplus water available from the Cape Town Corporation's Steenbras scheme; but after a detailed investigation of tender prices and the probable quantity of surplus water the commission abandoned the project.

STEAM POWER

Steam power is most extensively used in the Union and is encouraged by the plentiful supply of cheap coal. The two principal coal-mining areas are located in the Transvaal and in Natal; a fairly good supply is available also in the Orange Free State. As these sources are well connected by rail with various parts of the Union and offer low pit-head prices, coal as a generating fuel is in a favorable position. The use of steam turbines for generating electricity is therefore proportionately large. Virtually all of the larger central stations and many of the smaller ones are fueled with coal and operated by steam.

INDUSTRIAL USES OF CURRENT

Industrial developments in the Union, since definite steps were taken to foster the operation of local factories, have been reflected in the increased demand for electric motive power. In the year 1915–16 there were only 1,213 works in the Union employing electromotive power; 1,511 factories of various types relied on steam, water, or other mechanical power. By 1926–27 the number of factories using electricity for motive purposes had increased to 2,659, or by 119 per cent, whereas the number of factories using other motive power increased only 60 per cent.

The following table affords particulars of the provincial location of the works using electric motive power and the installed horsepower:

MOTIVE POWER IN FACTORIES IN EACH PROVINCE AND IN CERTAIN INDUSTRIAL CENTERS OF THE UNION OF SOUTH AFRICA, FOR YEAR ENDED MARCH 31, 1927

Province or center	Electrical works (number)	Installed horsepower
Cape Province:		
Cape Western	532	25,919
Port Elizabeth	128	4,107
All other centers	364	13,377
Total	1,024	43,403
Natal Province:		
Durban and Pinetown	294	22,892
All other centers	137	13,743
Total	431	36,635
Transvaal Province:		
Southern Transvaal	941	53,834
All other centers	123	9,468
Total	1,064	63,302
Orange Free State	140	5,812
Grand total	2,659	149,152

Although the following table does not segregate "electric" from "others," an analysis may throw some light on the extent of use, and the cost of fuel, light, and power by the various types of industries in the principal industrial centers of the Union:

COST OF FUEL, LIGHT, AND POWER USED IN FACTORIES IN CERTAIN INDUSTRIAL CENTERS AND IN THE UNION OF SOUTH AFRICA, 1926–27

Class of industry	Southern Transvaal	Cape Western	Durban and Pine-town	Port Elizabeth	Union, total
Raw materials	£1,928	£1,068	£5,092	£1,331	£21,397
Stone, clay, etc	143,574	30,017	9,025	4,933	427,946
Wood	8,315	6,305	5,584	1,590	28,933
Metals, engineering, etc	318,671	35,948	42,110	2,767	520,909
Food and drink	101,974	115,152	118,124	21,828	768,576
Clothing and textiles	18,502	15,455	5,327	2,282	47,699
Books and printing	14,828	15,416	5,211	2,036	48,792
Vehicles	12,142	5,690	3,164	1,542	46,015
Shipbuilding		325	18		343
Furniture	5,396	5,197	2,323	984	15,670
Chemicals	45,585	36,205	33,745	1,636	130,585
Surgical instruments [1] / Jewelry, etc.[1]	2,091	562	294	(2)	3,231
Heat, light and power	816,490	100,430	67,118	19,941	1,294,370
Leather and leatherware	3,575	7,794	518	11,047	34,481
Building and contracting	7,947	6,291	6,464	1,293	27,838
Other industries	3,526	41,506	25,701	[2] 240	83,650
Total	1,504,544	423,361	329,818	73,650	3,500,435

[1] Classes combined in respect of industrial centers, owing to small number of establishments concerned.
[2] Classes 12 and 13 are included in "Other industries."

MINES

The mines afford a very important outlet for electric current used for both power and light, and are considered one of the important influencing factors in electric-power circles. Their position in the Transvaal, the mining center of South Africa, is especially important since they consume at least 75 per cent of all current supplied in that Province. The total number of kilowatt-hours (both direct and alternating current) used by the mines in 1928 amounted to 1,121,291,562, as compared with 1,035,852,265 in 1927 and 986,001,193 in 1926. These figures do not include current supplied by power plants on the mines when used exclusively for mining purposes. The demands for power by the Witwatersrand gold mines continue to increase as additional mines are opened up; although further power may be available from the Witbank plant after a fifth set is installed, it is possible that even the added supply may not be sufficient to keep pace with the needs of the industry.

AGRICULTURE

South Africa is still fundamentally a producer of raw materials, and agriculture is the backbone of its economic structure. About 68 per cent of the total area of the Union, or 205,000,000 acres, is occupied as farm land; there are some 93,000 such farms in the Union, with 42 per cent of the European population recorded as "rural." The total agricultural valuation of land and improvements, machinery and implements, and livestock is estimated at more than £500,000,000, according to the South African Farmers' Handbook. These figures indicate a vast potential market for electric service and electrical appliances adapted to ordinary rural demands, but as yet little progress has been made in that field.

It is in the dairying field that the limited use of electrically operated equipment is being slowly extended. Bearing in mind, however, that the dairy industry, especially the liquid-milk division, is distinctly retarded by a decentralization that has brought about the establishment of a large number of small dairy farms handling only a few gallons of milk a day, one may easily visualize the limited demand for dairying equipment of modern design and fair capacity. Simple, and in many instances crude, improvizations of the bare necessities form the bulk of the apparatus in use by this group of small operators; few dairy farms can be referred to as modernly equipped, and these are mainly farms where milk is produced for shipment to wholesalers, and the few large dairy farms that distribute their own products. These latter have been equipped with cow stables that contain a few up-to-date fittings in varying ranges; but on the farms producing milk and cream for factories, little progress has been made.

The use of milking machines has scarcely been extended beyond a limited experimental stage, virtually all dairy farms using hand methods. One dairy-equipment specialist has gone so far as to state that not more than 15 or 20 milking machines are at present in use in South Africa. There are no means of substantiating this estimate, but it is unquestionable that their use is not widespread, though during the past two or three years there have been indications that they may be adopted gradually. There have been scarcely enough sales to indicate the particular type most popular, but it has been pointed out that the standard types, pulsating and vacuum with four milking units, would in all likelihood meet the dairyman's average need. One firm indicated that such apparatus should be as simple in construction and operation as is compatible with operating efficiency (bearing in mind the character of labor employed in South African dairy farms), with the pulsator on the pipe line rather than over each pail.

Modernization has been relatively more acceptable to the milk-depot group, yet even there little equipment is to be found in the average organization; in general, the apparatus used is simple and sometimes crude, and the daily handling is, on the average, so low that efficient machinery is seldom in demand. A greater concentration within the industry is essential before the normal requirements are increased.

Electricity supply is available on relatively few farms, but during the past few years the sale of home generating and lighting systems has been extended and the extensions of service lines from city stations have been increased. Nevertheless, a considerable amount of time will elapse before the availability of electric service is as widespread as in the United States and in many other countries.

RAILWAYS

Undoubtedly the inauguration of electric traction on certain sections of the railways has greatly influenced the increased use of direct current. In 1922 an act was passed by Parliament providing for the electrification of any line of railway. After investigating a number of schemes, the Government decided on the electrification of a section of the Natal main line, together with a small branch line, the total distance to cover 173½ route miles. The original scheme entitled the electrification of approximately 244 track miles but, in consequence of the development of traffic, it has been found necessary to electrify additional lines, consisting mainly of sidings, goods yards, etc.; the total Natal track electrified has consequently increased to approximately 310 miles. The main line carries a heavy goods service in addition to passenger traffic. The present scheme is designed to deal with a maximum daily tonnage of 30,000 in the coastward direction in addition to passenger traffic. There are 95 electric locomotives on hand.

The Railway Administration is also operating electric passenger trains on an important suburban line from Cape Town to Simonstown; the small quantity of freight carried on this line is hauled by steam locomotives. In 1927 the rolling stock consisted of 83 motor coaches, 37 driving trailers, and 95 plain trailers.

A short time ago another electric line running from Cape Town to Sea Point was in operation, but it has since been scrapped. This decision is understood to have been made after several years of unsuccessful operation both as a steam line and as an electric line; losses resulted from high cost of operation and from reduced patronage following the recent developments in motor-bus competition. By the time it was scrapped the cost to the administration had been over £300,000.

The line was constructed in 1891 by the Metropolitan and Suburban Railway Co. It was taken over by the administration in 1905 at a cost of £41,200. A sum of £32,233 was expended in reconstruction, bringing the cost to £73,433. The line was worked at a loss from the date of its acquisition, but from 1905 to 1915 the loss was borne by the municipality. Since 1915 the whole of the loss, amounting to not less than £150,000, has been borne by the administration. The line was electrified in 1927, fares were reduced, and a fast, comfortable service was inaugurated, but the railway could not compete with the trams and busses. The annual loss under steam has been from £12,000 to £13,000. Under electrification the loss increased to £20,000, explained by the fact that intensive bus competition synchronized with the change to electric power. Many of the trains often ran with less than a half-dozen passengers.

It should be definitely pointed out that, although motor transport advocates regard this action by the Railway Board as the "first railway surrender to bus competition," the geographical disadvantages were great, the line serving only a limited area and operating from a poorly situated terminus. It should also be noted that, during years previous to bus competition when the line was steam operated, a loss was also suffered.

STREET CARS

All public street cars in the Union, used for the conveyance of passengers, employ electric traction. The latest available official statistics (1927–28) show that only 10 street-car systems are operating, and of these 1 is the trackless-trolley type. These 10 systems in 1927–28 used 35,694,355 kilowatt-hours of electricity in carrying 143,523,499 passengers over 13,509,785 car-miles. During 1928 the imports of tramway materials, both for operation and for construction purposes, were valued at £25,284, of which £23,974 came from the United Kingdom and £1,256 from the United States. In 1927 similar importations totaled £56,292, of which £44,781 came from the United Kingdom and £11,337 from the United States. Details of the imports for 1929 are not yet available, but during the nine months ended September 30 the total value was £30,725, or £6,256 above the same period in 1928.

So far as known, there has been no particular change in the competitive position of British and American supplies. In recent years Johannesburg has been building its own trams in the municipal shops, importing the trucks, motors, and other parts not procurable locally.

CRANES

The industrial use of electric cranes is, on account of the small number of "heavy" industries, decidedly limited and there are relatively few in operation. The railways and harbors are the largest users, and their calls for tenders are not infrequent.

According to the latest report of the General Manager of Railways and Harbours, the several harbors of the Union were equipped with cranes of various capacities, as follows: Table Bay, 45 electric cranes ranging in lifting capacity from 3 to 15 tons; Port Elizabeth, 1 crane of 20 tons; East London, 21 cranes of 3 to 20 tons; Durban, 38 cranes of 3 to 4 tons; and Walvis Bay (South West Africa), 6 cranes of 4 and 7 tons.

ELECTRICAL MACHINERY AND EQUIPMENT

Machinery powered by electricity has been well received by the industrial fraternity, and the sale of machinery used in the production of electric power has likewise received some impetus. The advances made in supplying power to users throughout the country have been reflected in the values of electrical machinery imports during the past few years.

IMPORTS

Commercial imports of electrical machinery have been very substantial for several years and have maintained a fairly consistent progress, though the total values for 1928 (the latest available figures) were somewhat less than those for 1927.

The following figures, extracted from official trade returns for 1926–1928, indicate the advances made in the several lines included under the heading Electrical Machinery.

SOUTH AFRICAN IMPORTS OF ELECTRICAL MACHINERY (NOT INCLUDING CERTAIN FITTINGS AND MATERIALS)

Article	1926	1927	1928
Dynamos and generators	£28,364	£56,994	£66,537
Motors	122,363	183,493	138,391
Transformers	61,622	91,404	106,268
Machinery, electric, and parts, n. e. e	906,603	990,388	877,017
Batteries, primary	52,106	96,219	114,948
Batteries, secondary	59,864	83,850	81,779
Total	1,230,922	1,502,348	1,384,942

There follows a table of import statistics covering the "heavy" lines of electrical machinery (dynamos, generators, motors, and transformers) coming into South Africa during the years 1925–1928.

IMPORTS OF HEAVY ELECTRICAL MACHINERY INTO THE UNION OF SOUTH AFRICA, 1925–1928

Country of origin	Dynamos and generators				Transformers			
	1925	1926	1927	1928	1925	1926	1927	1928
United Kingdom	£63,789	£22,859	£48,923	£57,683	£101,979	£39,525	£55,285	£72,302
Germany	3,009	2,102	2,759	3,126	1,296	6,307	6,336	9,236
United States	2,673	2,925	4,639	4,932	7,425	12,072	22,561	15,277
Others	597	478	673	796	3,407	3,718	7,222	9,453
Total	70,068	28,364	56,994	66,537	114,107	61,622	91,404	106,268

Country of origin	Motors							
	1925		1926		1927		1928	
	Quantity (kilowatts)	Value	Quantity (kilowatts)	Value	Quantity (kilowatts)	Value	Quantity (kilowatts)	Value
United Kingdom	22,768	£101,514	62,783	£67,716	24,795	£122,461	21,439	£81,621
Germany	4,739	16,226	2,720	13,068	2,045	11,472	3,591	17,964
Netherlands	1,165	3,165	1,939	7,308	2,508	9,232	1,340	7,031
Denmark	385	2,235	481	1,583	2,227	4,135	701	4,318
United States	2,293	17,146	4,946	29,280	4,394	32,952	2,591	20,225
Others	1,679	5,878	914	3,408	831	3,241	1,983	7,232
Total	33,029	146,164	73,783	122,363	36,800	183,493	31,645	138,391

On the whole, the United Kingdom controls the major part of the trade, with the United States and Germany furnishing a limited amount of competition. Although American electrical machinery is well regarded by users in South Africa and no distinct prejudice is evident, there has been a well-sustained preference for British products, and these are strongly entrenched in the market. This condition has undoubtedly been influenced by a number of factors, including the practice of maintaining factory representatives or branch offices in South Africa, the effect of considerable sums of British capital invested in local enterprises, and the fact that a considerable number of technical advisers and engineers have been trained in English universities.

MINE PURCHASES

Among industrial purchasers the mines are a most important factor, buying in 1928 electric generators and engines, hoists and motors to the extent of £259,801, and power lines, transformers, bells, telephones, etc., to the amount of £226,450. In 1928 they bought £651,868 worth of electrical machinery and parts—a decrease of £186,536 from 1927. This machinery is usually purchased on tenders by local firms, as it is the policy to buy only from manufacturers having responsible representatives in the country.

MINE PURCHASES OF ELECTRICAL MACHINERY IN THE UNION OF SOUTH AFRICA

Article	1926	1927	1928
Generators and generator sets	£60,234	£6,213	£14,959
Electric hoists and motors for hoists	179,761	266,222	156,126
Electric locomotives	25,842	26,404	23,484
Motor-driven pumps and pump motors	43,685	23,253	20,433
Other electric motors	59,244	53,679	44,799
Transformers and power-line materials	177,944	173,715	136,174
Communication devices (including telephones)	37,450	50,191	44,638
Other machinery	38,315	63,296	45,638
Spare parts and repair materials	142,563	175,431	165,617
Total	765,038	838,404	651,868

DYNAMOS AND GENERATORS

In the field of dynamos and generators British products easily lead the way, their dominance ranging from 80 to 90 per cent of the annual value of these imports. In 1927 the imports from this source reached a value of £48,923 out of a total £56,994; the United States ranked second, with £4,639; and Germany third, with £2,759. For many years British electrical machinery of this nature has been used in South Africa and, although other makes are accepted and even demanded on occasions, its relative position has not been seriously challenged.

The mines are important users of this type of equipment, in 1928 purchasing £14,959 worth of electric generators and engines driving same, if directly driven.

MUNICIPAL TYPES

Municipal and Government undertakings are the most important outlets for this type of equipment, and a fair share of the imports are diverted to such channels.

Types and makes of generators and dynamos used by the municipalities of the Union differ considerably. Although there are no complete and reliable data showing the total number of each kind in operation, a review of the equipment of several of the important cities will afford some idea of the popular types and makes.

Johannesburg.—The Johannesburg plant includes, according to the "South African municipal yearbook, 1927–28":

In engines and generators: Three Belliss & Morcom impulse type steam turbines, with 1 each Lahmeyer and Siemens 3,000-kilowatt 3-phase alternators; 6 Belliss & Morcom reciprocating engines, with Dick Kerr, A. E. G., Mather &

Platt, E. C. C., and Siemens generators from 250 to 1,000 kilowatt capacity; 2 Parsons reaction steam turbines, with Parsons alternators.

In auxiliary plant: Surface condensers and natural-draft brushwood cooling tower; 4 Bruce Peebles La Coeur converters of 750 and 2,000 kilowatt capacity.

Cape Town.—The Cape Town system includes:

In engines and generators: Two B. T. H. impulse turbines, connected with 3,000-kilowatt 2-phase 50-cycle 2,200-volt alternator; and three Metropolitan-Vickers 7,500-kilowatt 3-phase 50-cycle 11,000-volt turbogenerators.

In auxiliary plant: Chain grate stokers and bucket coal conveyor; surface condensers on each turbine; one booster for battery; four 1,000-kilowatt Bruce Peebles motor generators; and two 1,000-kilowatt E. C. C. rotary converters.

Durban.—The Durban system includes:

In generators: One 1,500-kilowatt Parsons turbogenerator 3-phase 6,600-volt; two 2,000-kilowatt Parsons steam turbines, 3-phase 6,600-volt 50-cycle; two 3,000-kilowatt B. T. H. impulse turbines, 3-phase 6,600-volt; one 3,000-kilowatt Metropolitan-Vickers impulse turbines, 3-phase 6,600-volt; two 5,000-kilowatt Metropolitan-Vickers impulse turbines, 3-phase 6,600-volt.

East London.—This system includes:

In engines and generators: Four Belliss & Morcom compound and triple-expansion engines, coupled to A. E. G. and Siemens direct-current and alternating-current generators; two Brush-Ljungstrom steam turbines.

Pietermaritzburg.—This system includes:

In engines: Seven Willans & Robinson central-valve engines, total capacity of 1,300 kilowatts; one 890-kilowatt Westinghouse impulse-type turbine, with tandem generators; one 1,500-kilowatt B. T. H. impulse-type turboalternator.

In generators: One 533-kilowatt single-phase alternator and one 350-kilowatt dynamo, connected to turbines in tandem; two 120-kilowatt and two 240-kilowatt Brush alternators; two 120-kilowatt Brush dynamos; one 250-kilowatt Thomas Parker dynamo; a 250-kilovolt-ampere rotary converter; and one 1,500-kilowatt B. T. H. 3-phase alternator.

Bloemfontein.—The system includes:

In engines and generators: Four Belliss & Morcom triple-expansion steam engines, coupled to two E. C. C. 3-phase alternators of 600 kilowatts each and to two Crompton 3-phase alternators of 225 kilowatts each; one 1,000-kilowatt Metropolitan-Vickers steam turbine.

In auxiliary plant: Ledward evaporative condensers; two Bruce Peebles 250-kilowatt motor generators from 2,200-volt alternating current to 550-volt direct current, for tramways; Green's economizers, natural-draft cooling tower.

Pretoria.—This system includes:

In engines and generators: Three Fraser & Chalmers steam turbines; three G. E. C. 6,600-volt 3-phase 50-cycle alternators, with total capacity of 10,000 kilowatts.

Port Elizabeth.—The system includes:

In turbines and engines: Three 400-kilowatt Brush steam turbo direct-current sets; one Browett-Lindley 350-kilowatt combined reciprocating engine set, with direct-current generator and alternator; and two 1 000-kilowatt Fraser & Chalmers–Dick Kerr turbo alternators of 9,550-kilowatt capacity; three 500-kilowatt and one 250-kilowatt Bruce Peebles La Coeur motor converters.

In generators: Six 200-kilowatt direct-current generators, two in tandem for each turbine; and five 6,600-volt alternators.

COMPETITION

Competition is keen between the several well-known British, German, and American makes represented, and especially among engineering houses, factory representatives, and branches of the first

named. Among the installations of generators at various undertakings in South Africa one will find the following makes:

Metropolitan-Vickers	British.
Siemens	German.
English Electric	British.
Bruce-Peebles	Do.
Crompton-Parkinson	Do.
American (2 makes)	United States.
Thomas Parker	British.
Mathers & Platt	Do.
British Thompson Houston	Do.

Well-informed members of the trade have advised that the first four lines are quite popular and have been installed in a number of cities. An American make also has met with some success, especially in the larger installations, and has been giving satisfactory service for some years.

Crompton and Parkinson, since their combination, are reported to be doing an excellent business in the smaller rotating electric machinery and have been able to lay down units at attractive prices.

MINE PURCHASES

The mines of South Africa expend substantial sums on generators, as the £60,234 and £14,959 paid out for generators and generator sets in 1926 and 1928, respectively, will testify.

TRANSFORMERS

COMPETITION

In the transformer field also a number of manufacturers are keenly competing for sales, and there again British machines are well in. Germany, the Netherlands, and the United States are serious competitors, but manufacturers in the United Kingdom lead the way in sales. Small American transformers up to 50 kilovolt-amperes are well liked, and in the field of large-size installations in particular they are held in high regard. Few large American installations are made and, according to trade reports, it is in the small types that they can more easily compete. Stock sizes carried at distribution points enable them to offer competitive prices, since these are shipped to South Africa in quantity; then, too, quick delivery plays a strong part. It is understood that on straight indent orders the British and continental firms can underquote American transformers. Price consideration is given an important place in determining the purchase of electrical machinery and greatly influences the market. Performance, as a sales factor, is not given the same consideration generally as in the United States, England, or any other country; the lowest price usually wins the sale.

Some sales of transformers have been consummated without definite guaranty of performance to meet the particular needs of the undertakings, and there have been instances in which the municipal electrical engineer, consulting experts, and other qualified individuals have specified a certain transformer on a performance basis, only to have a nontechnical council or committee hand the order to the lowest bidder. Then, too, prices are cut very fine and are not

stable. When business is slow for one of the many competitors, it is not an uncommon practice for the concern to cut prices even below a profitable level in order to get the trade. The Czechoslovak transformer "Elin" was introduced on that basis, selling far below other competing makes; after being installed on a number of occasions the price was raised, and it now sells higher than do several original competitors.

IMPORTS—MINE PURCHASES

In 1928 some £106,268 represented the total value of transformers (other than Government) imported into the Union, of which imports from the United Kingdom comprised 68 per cent, from the United States 14 per cent, and from Germany 9 per cent. These figures show clearly the relative importance of the three leading oversea suppliers of transformers.

Among those noted in various undertakings are the following (which does not mean, however, that the list is complete):

English Electric	British
Smit	Netherland
Siemens	German
Metropolitan-Vickers	British
Bruce-Peebles	Do.
Ferranti	Do.
Johnson	Do.
American	United States
Hackbridge	British
Swedish General Electric	Swedish
Elin	Czechoslovak

In the opinion of one important member of the trade, the first five are the most popular or are represented in the greater number of undertakings, though this opinion can not be substantiated by actual census figures. It has been pointed out that both English Electric and Smit transformers have been purchased in preference to a number of other competing makes on account of the much lower price quoted, which would seem to bear out the statement previously made—that price is a most important factor in the sale of electrical machinery. Scarcely too much stress can be laid on the keenness of competition in the entire field of electrical machinery.

The mines purchase annually between £135,000 and £175,000 worth of transformers and power-line materials.

PREFERRED TYPES

For stepping down from primary to secondary voltage it is still customary in South Africa to use a small number of medium or large transformers in lieu of a large number of small ones. By the use of these transformers properly distributed, a supply of 220/440 secondary voltages can be supplied to a large area. This tendency is also influenced by the fact that the Electricity Supply Commission, in many instances, is supplying bulk-power facilities at various points.

The larger towns of the Union have been prone to install transformers of a general minimum of 50 kilovolt-amperes, the 20-kilowatt size being considered small. Apparently there has been a tendency to allow for growth of the towns as well as to appreciate the economy of larger-sized operation. Core-type transformers are

most popular, due, it is believed, to the ease with which they are repaired. Both single-phase and 3-phase transformers are used, with the latter favored in some instances on account of the saving in freight as compared with a similar capacity in single-phase units.

MOTORS

In the matter of motors, the United Kingdom is again the leading supplier of the Union, as will be noted from the table entitled "Imports of heavy electrical machinery into South Africa" (p. 14). The general trade in motors fluctuates from year to year, and with it the size of the trade between Great Britain and the Union of South Africa also fluctuates. In 1928 the total value of motors imported dropped to £138,391, to which the United Kingdom contributed 59 per cent, the United States 14.6 per cent, and Germany 13 per cent. The year preceding the United States supplied 18 per cent of the total and Germany 6 per cent, thus indicating a change in the flow of business during 1928.

The Netherlands and Denmark are also important suppliers but have not yet challenged the three leading nations. The principal competing makes are covered in a general way by the list appearing under "Dynamos and Generators" (p. 17).

DIRECT-CURRENT MOTORS

While a certain number of direct-current motors are used in gold mining, especially in hoist equipments of large capacity, and in the coal, diamond, and base-mineral mines, they are being replaced generally by alternating-current motors. The mines subject motors to very severe treatment, and for this reason some purchasers insist that in sets they require the full-load temperature rise shall not exceed 30° C. with the air at 25° C., which corresponds to 35° C. rise with the air temperature 35° C. at 6,000 feet altitude. For small standard direct-current motors the usual American practice is satisfactory, the ratings being fairly liberal as compared with the average competition met.

The standard voltage for large direct-current motors is 500 volts, and for smaller motors from 220 to 500 volts. Great Britain, the Netherlands, and Sweden lead in that order in supplying the demand for direct-current motors, according to one authority. Not many American motors of this type are being sold, as they are usually out of line in price—a condition that prevails in the large-motor field as well as in the small-motor field. German manufacturers are endeavoring to recover lost trade, but have not been especially successful in the face of the combined price, quality, and sentiment factors favoring the British products. It is freely rumored that these latter are being sold at less than cost.

ALTERNATING-CURRENT MOTORS

In the alternating-current motor field 3-phase motors chiefly are installed; although at one time single-phase and 2-phase systems were popular, they are becoming less in demand except in a few small towns. The frequency is almost entirely 50 cycles, although there are two mines with 25-cycle motors and one cement plant with

a 60-cycle motor. The voltages are 400 and 500 volts for the smaller 3-phase motors, and 2,000 to 3,000 volts for the large motors. For single-phase units, 400 volts appear to be most common, with 200 volts for the smaller sizes. "Squirrel-cage" motors are used up to 100 horsepower; some of the mines use them for horsepower exceeding that figure.

COMPETITION

British slip-ring motors have ousted the German products, which once held the market, and specifications for mine installations are based on the British standards. Lahmeyer (German) motors, which at one time were well established in South Africa, are reported to be virtually out of the market. The principal British motors being sold at this time are the Thompson-Houston, Crompton-Parkinson, and Metropolitan-Vickers. Most mines insist that both ends of stator windings be brought to cable-end boxes.

In motors of less than 100 horsepower competition is extraordinarily keen, with a large and overcrowded field striving for sales. As for individual popularity, one dealer has compiled the following list of makes, in order of tenders accepted over a recent period: Crompton-Parkinson (British), Heemaff (Netherlands); Metropolitan-Vickers (British), Swedish General Electric (Swedish), and Siemens-Shuckert (German).

For large motors of over 100 horsepower, he named the following: Metropolitan-Vickers (British), British General Electric (British), and Heemaff (Netherlands).

It should not be construed that this rating is based on the number installed or operating to-day, but it applies to purchases over a limited period of time. He made the following statement:

> With the markets here to-day the majority of the work obtained is secured by violent price-cutting competition. You will see, therefore, that the expression "most popular" can not properly be used in connection with this country, but the names given under the various headings represent firms who during the past 18 months have secured the business here.

The mines, together with the Government and municipalities, are important purchasers, as evidenced by the purchases in 1928 of £44,799 worth of motors other than "Motors for hoists" and "Pump motors."

CABLES AND WIRES

It is evident from the extent of electric-power developments and the extended use of current by factories, mines, and municipal consumers that a considerable amount of electric cable and wire is used annually. During the past few years South African imports in this line have averaged annually about £600,000.

COMPETITION

Great Britain leads as a source of supply, being responsible for about 90 per cent of the total South African imports in this class, due to some extent to the fact that British manufacturers produce cable and wire to the British Standard Association's requirements. In addition, they enjoy a preferential rate of tariff. According to a prominent member of the trade, the following British manufacturers

control the market: British Insulated and Helsby Cable Co. (Prescott, Lancashire), 40 per cent; Henley Telegraph Corporation (North Woolwich), 20 per cent; W. T. Glovers (Manchester), 15 per cent; Johnson & Phillips (London), 15 per cent; all others, 10 per cent.

Manufacturers of German cable have been endeavoring to capture a portion of the market since the war and, although some little success has been attained, they in no way challenge the strong position of the British cable. About 5 to 6 per cent of the trade is carried on in German cable. Complaints against German cable indicate that they are handicapped by the former use of continental standards by the manufacturers and that in delivery in many instances they do not come up to guaranteed specifications. "Over all" diameter measurements have been found to be out of line, due, it is believed, to the use of cotton braiding; the use of antimony instead of tin for hardening lead sheathings has also been a source of complaint.

The participation of the United States manufacturers has been restricted to less than 1 per cent of the total business and has been limited chiefly to rubber insulated cables, high and low tension, for trailer work, coal cutters, and portable machinery. In addition, some American cadmium-copper wire, shipped to England and made up there, is reshipped to this market where it appears in the import statistics as British shipments.

IMPORTS

The following table of imports of cable and wire into the Union of South Africa during the years 1925–1928 shows the chief oversea sources of supply and the trend of the trade.

SOUTH AFRICAN IMPORTS OF CABLE AND WIRE FOR ELECTRICAL USE

Country of origin	1925		1926		1927		1928	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
United Kingdom	223,012	£566,903	184,798	£554,101	169,527	£553,111	145,327	£509,068
Belgium	306	2,196	396	2,922	871	4,100	3,195	8,380
Germany	5,433	19,858	10,705	40,686	15,812	32,327	11,440	38,632
Netherlands	355	1,941	13	204	1,091	5,556	840	3,742
United States	750	4,367	976	5,393	1,555	5,870	1,165	6,315
Other	371	1,049	234	947	564	1,755	1,030	2,970
Total	230,227	596,314	197,122	604,253	189,420	602,719	162,997	569,109

PREFERRED TYPES

Some 50 per cent of the cable sold to South African consumers is of the paper-impregnated-insulated power and lighting (high and low voltage, lead covered, or lead covered and armored) type, and about 25 per cent is of the rubber-insulated power and lighting (high and low voltage, lead covered, or lead covered and armored) class, the two together accounting for almost three-fourths of the total trade. To dry-core air-space telephone cables may be attributed 5 per cent of the import trade, and the remainder is made up of bare copper hard-drawn conductivity wire for overhead power lines, telegraph bridle wires (cadmium copper or coppered steel), and others.

LOSS IN DISTRIBUTION OF CURRENT

Examination of the table entitled "Electric Power Supplied in the Union of South Africa" (p. 4), will reveal a considerable loss in distribution of current each year, especially in alternating current, amounting in some instances to as much as 9 per cent of the total number of kilowatt-hours generated. Loss in direct current amounted to 6 or 7 per cent on occasions. This loss in current through distribution may, according to reports from reliable sources, be attributed to the character of the cable employed. The following remarks touching on this subject are extracted from the South African Mining and Engineering Yearbook, 1928:

With the steady development of stage winding, pumping, and ventilation, the amount of electric power required underground has increased to an extraordinary degree of late years, and so far supply has in almost every case been effected at the standard pressure of 2,000 volts. The amount of copper, in cables, required to get large blocks of power down the various shafts and to give a reasonable voltage at points a mile, or even 2 miles, away from the collar has grown to tremendous proportions, so that it has become very difficult merely to find room in the shafts to accommodate the cables. At the same time the distribution losses, even with the low rates at which power is bought, have mounted up to large amounts in cash.

The cooperation of the leading cable makers of the world has been invited to devise a reliable type of shaft cable and suitable fittings to permit transmission underground at no less than ten times the pressure hitherto used, namely, at 20,000 volts. The problem bristles with difficulties, but it is evident that several firms of the highest repute are prepared to attempt its solution.

MUNICIPAL REGULATIONS

Municipal regulations governing the installation and operation of motors, generators, transformers, etc., are rather severe and, although there are some few differences in detail of regulations in effect in the various cities, they are on the whole similar.

The following promiscuous extracts from the Johannesburg By-Laws Governing the Supply and Use of Electric Energy (1929) will give a general idea of the precautions that should be taken by manufacturers producing for the South African trade.

All parts of motor generators, motors, transformers, or other similar apparatus at high pressure or extra high pressure and within reach from any position in which any person employed may require to be, shall be, so far as is reasonably practicable, so protected as to prevent danger.

All high-tension apparatus is to have the maker's name plate attached, on which shall be stamped full particulars of the apparatus rating.

TRANSFORMERS

In transformer substations the transformers must be placed so that fire and smoke from the burning out of the coils or the boiling over of the oil can do no harm. The windings of the primary and secondary are to be entirely separate. The transformer is to be connected to a separate double-pole way on the distribution board.

MOTORS

Where the starting current of any direct-current motor exceeds 5 amperes a suitable controlling switch and starting resistance must be provided. The starting switch must be provided with a no-voltage release so arranged that the switch automatically returns to starting point should supply be cut off.

Alternatively the no-volt release may take the form of a separate automatic switch.

The starting current of motors over 5 horsepower must not exceed one-and-a-half times full-load current.

Squirrel-cage motors of over 3 horsepower will not be allowed on single-phase mains, or of over 7 horsepower on the 3-phase mains, unless conforming to conditions as required in clause 4 of this section above.

All motors on 400 volt, single phase or 460 volt direct current, where full-load current is 10 amperes or over, must have a double-pole circuit breaker, with an overload coil on each pole to break at 50 per cent overload, fixed between the consumer's fuses and the motor itself.

Every motor of 1 horsepower and over must be controlled by a multiple-pole switch, which must be fixed within 12 feet of motor and in the same compartment, except in such cases where remote control is required; such control may be granted at the discretion of the general manager of the electricity department.

In the case of 3-phase motors of more than 10 amperes a triple-pole circuit breaker with three overload releases and one no-volt release will be required.

Where current supplied is in excess of 50 amperes, a double or multiple break switch of approved design shall be installed.

All conductors for motors of over 230 volts must be run in metal-screwed pipes to within 1 foot of the motor terminals, and made electrically continuous throughout and earthed efficiently as described below. Cables of approved type may be used, but permission to do so should first be granted by the general manager of the electricity department.

All metal work connected with a motor, starting switch, and resistance, which does not carry current, must be efficiently earthed, and in no case must copper earthing wire be smaller in size than 7/0.029.

The earth connection must not be made to a gas pipe.

All parts of the motor, starting switch, and resistances carrying current must be sufficiently guarded so as to prevent accidental contact or a short circuit. All such guards should be of metal and properly connected to earth, as mentioned above.

The brush rocker on the motor must be so arranged that it can not be moved in such a way as to bring either conductor into contact with the framework of the motor.

Motors must be protected from damp and dust, and must be so placed that no woodwork or inflammable material is within a distance of 12 inches, measured horizontally, or within 4 feet, measured vertically, and the same precautions must be adopted in placing and fixing the starting switches and resistances. The motor must be placed on a sheet of metal of sufficient size to protect the floor, unless the latter is fireproof.

The coils of starting resistances should be so designed that in no case do they heat above 212° F., even if left continuously in use. The coils should be insulated with porcelain or other noncombustible insulating material, and should be protected by suitable metal casing or guards, which must not interfere with the free circulation of air around the coils.

Where a motor is intended to be used in the presence of explosive dust or gas it should be of the completely inclosed type. If of the ordinary type, it should be completely inclosed in metallic casing, and arrangements should be made for efficient ventilation of such casing by means of air drawn from outside the building.

MERCHANDISING METHODS

The successful merchandising of electrical equipment and machinery is relatively difficult under the keen competitive conditions prevailing in South Africa, and several problems of importance immediately confront the oversea producer endeavoring to secure a profitable share of the available business.

Active intelligent representation is, in the face of the small number of engineering houses not already committed to competing lines, difficult to obtain. This difficulty has been met by a number of manufacturers by opening South African branches where stocks are carried, service is available, and the complete administration of sales and service is accomplished. Others have sent out factory representatives who tie up with well-known engineering houses that carry stocks and afford service. The factory man is engaged in making the sales and the tests, and in drawing up tenders—in reality direct-

ing the operations. After the branch establishment system, the latter, perhaps, has proved the most successful.

Another method favorably regarded is the employment of a local engineer or engineering house, on a retainer basis. These services are more than ordinary sales efforts and are therefore more remunerative to the engineer. The men are usually technical specialists in various types of electrical-machinery lines and are recognized as such by those who initiate and specify the purchase of electrical equipment.

COMMERCIAL EXCHANGE

A centralized buying mart, designed to concentrate buying for the mines, municipalities, railways, etc., has been established in Johannesburg. This commercial exchange occupies a very important position in the merchandising of electrical machinery and equipment; approved firms and mine buyers post their requirements from day to day, and members of the Witwatersrand Commercial Exchange then quote according to the specifications set down.

A considerable volume of business is conducted through this institution; American electrical-machinery manufacturers, before tieing up with representatives in South Africa, should assure themselves that this field is open to them. A list of the members of the exchange is on file in the commercial intelligence division, Bureau of Foreign and Domestic Commerce, Washington, D. C., and will be made available to qualified American firms that may be interested. In 1928 the volume of business done by the exchange in all lines exceeded $86,000,000 in value.

TECHNICAL SERVICE ESSENTIAL

It can not be too strongly urged that any distribution system adopted include provision for a complete and readily available technical service. All of the important, well-recognized, and successful firms operating in South Africa to-day are supplying such facilities; failure to provide for efficient service is a handicap not likely to be overcome. There have been instances where good salesmanship has secured excellent initial orders, but unsatisfactory service and technical advice has precluded further sales; the lines concerned consequently have acquired an unfavorable reputation.

DISTRIBUTION CENTERS

Johannesburg.—Johannesburg undoubtedly is the most important distribution point in the Union, serving a wide field of actual and potential purchasers of electrical machinery. The gold mines, heavy purchasers of equipment, are centered around Johannesburg, the large diamond mines are within a few hours by train or road, the city itself is an important industrial center, and several large undertakings are near by. Most of the branches of oversea manufacturers have their headquarters there, and technical men and factory engineers in most cases are located there. In addition, virtually all of the larger South African engineering houses operate from Johannesburg,

which is still used in many instances as a distribution point for the Rhodesias.

Other centers.—The Johannesburg headquarters are often supplemented by offices or branches in other important centers, including the coastal towns of Durban, Cape Town, and Port Elizabeth, where stocks may be largely centered.

Bloemfontein, in the Orange Free State, under some special conditions, appears in distribution schemes.

A few engineering firms have established branches also in Bulawayo to serve the Rhodesias.

There is a noticeable movement in the same field to provide "on the spot" facilities in N'Dola, Northern Rhodesia, to meet the needs of the group of copper mines in that locality, but the wisdom of such a procedure has not yet been established. There is, however, a possibility of the extension of the distribution system and in that direction.

ADVERTISING ESSENTIALS

The ultimate object of the manufacturer desirous of selling in the South African market is to place his product in the hands of the purchaser with the least possible expenditure of effort and money, and to that end he endeavors to eliminate as far as possible appeals to unprofitable fields or the employment of ineffective advertising. To accomplish this purpose, a thorough and intelligent analysis of the potentialities of the market, the buying habits of the particular industry in which he is interested, and the channels of sales approach and advertising appeal is essential. The carrying out of such a plan, difficult enough in the United States, where detailed statistics and data of a helpful character are to be obtained, is rendered even harder in the Union of South Africa on account of the limited sources of authentic detailed information. However, some rather reliable and helpful conclusions may be drawn.

MARKET SURVEY

The first step is elemental and involves the determination of whether an actual or potential market of worth-while size exists for the character of machinery produced. The preceding pages afford some idea of the conditions prevailing in the South African market and an impression of the extent of the market for electrical machinery in general. Of course, certain factors, such as adverse competitive conditions, special sales resistance, cost of supplying the market, and other influential features, should be carefully weighed, and the temptation to reach out after marginal business that is worth while neither for individual nor for collective sales should be stifled.

BUYING HABITS

In preparing for a sales or advertising campaign, after having determined the industries offering the most encouraging possibilities of sale as well as their location and potential purchasing limits, it is advisable to ascertain the actual "key" men—those who are

accountable for results in production and maintenance, and who, therefore, dictate and control the buying of electrical machinery. Works managers, general managers, chief or consulting engineers, chief electricians, and similar individuals are such "key" men.

It is of great benefit to ascertain the actual job as well as the title of (*a*) those in each organization who are responsible for initiating the purchase of machinery and (*b*) those actually specifying the equipment. This is not always possible owing to a confusion in titles used by industry, but one is ordinarily able to determine the type of men who control buying in each field.

It is the consensus of opinion of a number of electrical-machinery men, as well as industrialists, that often the initiation of purchase and the specification of equipment are in the hands of the same individual (who is more often a member of the operating staff rather than of the executive staff), with the possible concurrence of a committee or consultant. In the mining industry, often two individuals perform the distinct function of initiating and specifying, and a third—the purchasing agent—actually makes the purchasing contract. A list of these latter may be obtained from the commercial intelligence division of the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Advertising electrical machinery effectively presents specific problems basically distinct from those connected with the advertising of domestic electrical equipment, for entirely different channels are employed.

DOMESTIC ELECTRICAL APPLIANCES

The sale of domestic electrical apparatus and appliances is dependent on the availability of electric current at prices that make possible the operation of such devices by the person of average income. The market limits for most items in this group are, to a large extent, controlled by such factors as population, consumer income, current and supply, current costs, competition from gas and other forms of energy delivered to the home, educational or missionary work, and advertising.

POTENTIAL MARKET

The population limits of the Union have been noted in the earlier pages of this bulletin. The considerable number of rural dwellers, most of whom have no accessible supply of current, is also a retarding influence and greatly restricts the limits of the market for many electrical domestic appliances. Furthermore, the spirit of conservatism prevails in considerably greater proportions than in the cities. In this respect Johannesburg is considered the best city in which to introduce new products, as its citizens manifest a readier willingness to consider new commodities than do the people in other cities.

CURRENT AVAILABILITY

Residences of every size and possessing every refinement may be found, but the average home contains from four to six rooms and is usually of the single-story, or bungalow, type. Unfortunately, no

nation-wide statistics of wired homes are to be obtained, but the following table showing the population and the approximate number of consumers of electric-light current in the larger municipalities of South Africa in 1927 will afford a reliable index to the possible users of domestic devices, as well as indicating the lighting voltage in use.

DOMESTIC CONSUMERS OF ELECTRIC-LIGHT CURRENT IN LARGER SOUTH AFRICAN CITIES, 1927

[By approximate number]

City	Total population	Private dwellings (1926) [1]	Consumers of current for light	Declared lighting voltage	
				Alternating current	Direct current
Benoni	50,743	2,827	2,308	220	----------
Bloemfontein	44,420	3,173	3,112	200	----------
Cape Town	225,358	19,672	21,293	220	220
Durban	112,751	10,973	16,685	100 200	----------
East London	36,600	3,630	4,081	220	----------
Germiston	49,954	3,755	2,407	120	----------
Johannesburg	311,007	29,362	31,878	200	230
Kimberley	40,000	3,221	3,840	220	----------
Pietermaritzburg	41,229	3,103	4,620	200	----------
Port Elizabeth	57,216	5,246	5,738	250	250
Pretoria	65,044	8,603	7,980	250	250

[1] According to 1926 census of European families only.

As for the number of these wired homes which may be regarded as prospective purchasers, no reliable figure can be set down. One prominent dealer in Johannesburg estimates, on no tangible basis, that not more than 12 to 15 per cent of Johannesburg electric-current users are potential purchasers of electric household devices at this time. Other dealers are inclined to believe this estimate too high, and place the figure at nearer 5 per cent.

COST OF CURRENT

The cost of electric current varies considerably in the several important cities, Durban offering special inducements to the householder in the way of cheap current, and Johannesburg charging considerably higher rates. However, the recent announcement by the Johannesburg municipal electricity department that during the past (year 1928–29) a new record in the matter of profit was set up when approximately $500,000 was realized has raised the old demand for cheaper current for domestic consumers.

The tramway and lighting committee has been considering a reduction in the price of domestic current from 1d. to ¾d. per kilowatt-hour for all electricity consumers after the quota at 6d. per kilowatt-hour has been used. Now that the department shows such a handsome profit, the committee may lower the price of current. One of the obstacles to a further extension of the use of household electrical appliances in Johannesburg has been the cost of current, and any reduction in domestic prices is expected to stimulate the trade in such commodities.

COST TO CONSUMERS OF ELECTRICITY IN CITIES OF THE UNION OF SOUTH AFRICA

[1d. (1 penny) equals 2.028 cents, U. S. currency; 1s. (1 shilling) equals 24.332 cents]

PRIVATE CONSUMPTION

City	Lighting and domestic use	Motive power
Johannesburg	5 kilowatt-hours, at 6d. per month, and balance, at 1d.; business, first 1,000 at 6d., and over 5,000 at 2d.	First 2,500, at 1½d.; balance, 1¼d. per kilowatt-hour.
Cape Town	Heating and cooking, 1d.; special hot water, ½d.; lighting, flat, 5d.; lighting, domestic, 5 kilowatt-hours per room per month, 5d., and all over, 1d.	Vehicle-battery charges 10 p. m. to 8 a. m., ½d.; 8 a. m. to 10 p. m., as for motors; motors, 2d. to 0.8d.
Pretoria	5d. and 2d. flat; Norwich, 5d., 2d., 1d. and 0.75d.; continuous water heating, ½d.	3d. to ¾d. less 5 per cent for primary supply.
Port Elizabeth	Lighting, 6d. and 1d.; other than private, 6d. and 3d.; shop windows, 6d.; heating, 1d.; motion-picture projectors, 6d. and 3d.	Sliding scale, 3d. to 1¼d.; also, rate dependent on load factor for large consumers.
Germiston	Lighting, 4d.; heating, 1¼d. above minimum of 6 kilowatt-hours per room; minimum, 5s. per month.	Sliding scale, 3d. to 1¼d.; also, rate dependent on load factor for large consumers.
Bloemfontein	2-part fixed charge, 6s. to 18s. per month, plus ¾d. per kilowatt-hour.	5s. per horsepower up to 20 horsepower; 2s. 6d. per horsepower from 21 up to 50 horsepower, plus 1d. per kilowatt-hour.
Pietermaritzburg	Business, 6d. to 4½d., less 10 per cent; private consumers, 4 kilowatt-hours per room, at 6d., and balance at 1d., less 10 per cent.	1½d. to 0.5d., less 10 per cent.
East London	Lighting, 8d. and 1d.; other than private, 8d.; 2-part rate, 8d. and 3d.; heating, 1d.	Sliding scale, 3d. to ¾d.
Kimberley	Light, 6d.; domestic, 1½d.	1½d. up to 2,400 kilowatt-hours; excess, 1¼d.
Benoni	Lighting, 5d. and 4d.; domestic, 2½d.; combined lighting and domestic, 5d. and 1½d.; minimum charge, 5s. per month.	No guaranty, 2¼d. to 1s. 6d. per kilowatt-hour; with guaranty 1s. 6d. to 1d.
Krugersdorp	Domestic, 9s. for 18 kilowatt-hours, and balance, 2d.; shops, 15s. for 30 kilowatt-hours, and balance, 2d.	2d. and 1¼d.
Boksburg	Sliding scale, 7d. to 4½d.	1½d. from 6 a. m. to 6 p. m.

MUNICIPAL CONSUMPTION

City	Light	Motive power	Street lamps [1]	Trams [1]
Johannesburg	6d. to 1d.	6d. to 1d.	1.06d.	0.63689d.
Cape Town	2¼d.	2d. to 0.08d.	£20,000	2¼d. flat.
Durban	4d.	0.85d. plus 10 per cent	£2 for 50 candlepower £7 8s. for 400 candlepower.	
Pretoria	5d. and 2d.	3d. to ¾d., less 5 per cent, for high-tension supply.	1d. plus maintenance 2½d.	0.0833d.
Port Elizabeth	Cost price.	Cost price.	2½d.	
Bloemfontein	6d.	2d.	6d.	
Pietermaritzburg	6d.	2d. and ¾d.	3d.	1¼d.
East London	3d.	3d. to ¾d.	3d.	1d.
Kimberley	2¾d.	1¾d.	2¾d.	(2).
Krugersdorp	4d.	1½d. and ¾d.	3d.	
Boksburg	3d.	1½d.	2d. per kilowatt-hour	

[1] Including capital charges.
[2] Owned by De Beers.

MUNICIPAL WIRING REGULATIONS

Wiring practices in South Africa differ very little from those prevailing in England; in fact, it is set down in the regulations of important towns that every installation shall conform with the latest edition of the wiring rules of the Institution of Electrical Engineers (London). The following extracts taken at random from the Johannesburg regulations may be regarded as typical of wiring regulations employed in other cities:

Lighting and heating installations of more than 100 outlets or lamps or requiring more than 25 amperes normal maximum demand may, at the option of the municipality, be required to take supply on the 3-wire or multiple-phase system where such is available, and must be wired as two or more separate 2-wire installations from the main distribution board, which installation shall be evenly balanced.

The main switch shall be a multiple-linked switch of not less than 10 amperes capacity of a type approved by the department, and the main cut-outs shall be single-pole cut-outs of a type approved by the department, and any installation exceeding 10 amperes must be provided with a double-pole linked main switch and fuses of the ironclad type approved by the department.

All switches, ceiling roses, and other fittings, not fixed to switchboards or distribution boards, must be mounted on hardwood recessed blocks or specially designed metal boxes, and when fastened to walls shall be screwed to wedge-shaped blocks of ample size, cemented into the wall.

All insulated copper conductors must be stranded. The insulation shall consist of one or more coatings of pure rubber next the conductor, with a coating of vulcanized rubber covered with proofed tape, the whole being vulcanized together and finished with compounded braiding. The dielectric shall contain no organic matter except pure fine rubber, and shall show no sign of saponification when subjected to the action of wet steam at 320° F. for three hours. The rubber, after the conductor and braiding and taping have been removed, shall stand an elongation test of stretching to double its original length for 24 hours, when it shall return to within 20 per cent of its original length after 24 hours.

Joints are not allowed in tubing or in any tube fittings, except in a junction box of ample dimensions with an inspection cover, and the joint shall be surrounded by an approved tube. Small circular junction boxes are not permitted. Joints must be insulated with two layers of pure rubber strip, well stretched on, and wrapped with adhesive waterproof tape.

Joints between fitting wires and circuit wires must be made in the space immediately behind the base of the fitting, below the ceiling, by means of screwed connectors on a porcelain base recessed into a hardwood block or placed in a junction box.

All tubing in inaccessible or damp places, buried in concrete, or exposed to weather shall be not less than ⅝-inch diameter, solid drawn, brazed or welded, and shall have screwed joints, and no solid elbows or sharp bends are permitted. All bends shall be made by a suitable bending machine, and tubes flattened or split must be rejected.

Flexible cord must not be used above ceilings, or in concealed places, or in conduits, or in damp places, or in verandas, or in doorways, or any place exposed to the weather, or in butchers', confectioners', or fruit or fish shops, or in stables, public bars, public dining rooms, kitchens, or bathrooms, or in any places where it would be particularly exposed to the action of flies or other insects; or in inclosed shop windows, or in any place where inflammable material is exposed near to it.

Flexible cord may only be used for switch leads in cases where required for use as suspension switches, and in such cases may only be subsidiary switches and must hang straight from the ceiling rose not less than 6 inches from the wall. Flexible cord may be used for a 1-point extension from a ceiling rose in the same room, provided it is carried through insulated screw eyes not more than 3 feet apart in full sight and not less than 8 feet above the floor level, and it shall not pass through walls or partitions; but in no case will more than one flexible connection be permitted from each ceiling rose.

All branch cut-outs and fuses shall be placed at distribution boards and, where more than one circuit is required, a distribution board of approved type must be used.

Wall plugs and sockets shall be of approved type and of such design that live parts are not exposed. Wall plugs to carry more than 5 amperes shall be designed with the current-carrying parts proportionately larger. Each wall plug must be controlled by a switch conveniently adjacent. Wall plugs shall be wired on circuits separate from fixed lighting points, and no wall-plug circuit shall carry more than three plugs or be wired with cable of less than 3/0.036.

HEATING AND COOKING APPLIANCES

The wiring for water heaters, stoves, and domestic utensils, consuming maximum current of 10 amperes (2,000 watts) or more, shall be wired separately from the lighting system and carried back to a main distributing panel. All wiring in sight to be carried out in screwed tube.

A double-pole ironclad switch and cut-outs to be fixed at distributing panel and also suitable switch and cut-outs of approved type to be installed within 3 feet of utensil. Water-heating appliances, if used in bathrooms, must not be connected by flexible wires. No loose wires of any description will be permitted, and the type of fittings and switches shall be approved.

All fixed heating and cooking appliances shall be efficiently earthed to a water-service pipe, with stranded copper wire of not less than 0.0225 square-inch area and provided with an approved lightning arrester on live leg. In cases where the appliance is not permanently fixed a 3-point plug, with one point efficiently connected to earth, shall be provided.

The carrying capacity of conductors to cookers or water heaters shall be in accordance with the Institution of Electrical Engineers' rules.

All cooking and heating appliances must have plainly marked on them the pressure for which they are intended and the current consumption. No appliance taking more than 1½ amperes shall be attached to an adapter fitting a lamp holder. The current used in any water-heating circuit shall not exceed 15 amperes, and in any other circuit shall not exceed 30 amperes, unless special permission has been given by the department.

Where the maximum rated current on the apparatus exceeds 30 amperes a 3-wire 400-volt alternating-current or 460-volt direct-current circuit shall be provided, and a double-pole ironclad switch and fuses installed within 3 feet of the apparatus.

VACUUM CLEANERS

There is a slight but perceptible increase in the use of household electrical apparatus in South Africa, with the customary disinterested attitude of the housewife yielding slowly to persistent educational efforts on the part of apparatus manufacturers. The progress is very slow, however, and sales are restricted by the available ample supply of low-wage household servants as well as by the natural conditions prevailing in the field.

There are no available means by which the number of vacuum cleaners in South Africa may be determined. A census of such equipment has not been taken, and even separately classified import statistics are not available. It is known, however, that imports are relatively small and that the use of vacuum cleaners or similar apparatus is decidedly limited, with the market responding slowly to strong efforts on the part of dealers. Without reliable statistics or a source of dependable estimates it is impossible to hazard a guess as to the number of cleaners in South Africa; but it is generally admitted by the trade that the percentage of houses possessing vacuum cleaners is very small and is far below that of other countries where cheap labor is not available.

COMPETITION

In the vacuum-cleaner field competition is exceedingly keen, there being a dozen or two makes of apparatus striving to control a good share of the distinctly limited sales. The number of manufacturers endeavoring to sell their product in South Africa already exceeds the number of available interested dealers of an active character, with the result that many carry a number of competing lines. One of the most prominent local dealers is handling six competing makes at this time.

The British Electrolux holds the leading position, due to the fact that the retailers have been conducting a house-to-house canvassing campaign for the past several years. Although the prices are higher than for a number of competitive makes handled by retailers, selling to the consumer at £18 18s., the retailers allow credit terms, payment being made on the installment plan spread over a year. The educative results of the Electrolux campaign have been of considerable value in popularizing electric vacuum cleaners, but it is doubtful if sales have warranted the outlay. There are no facilities for determining the approximate sales of each kind.

Aside from the Electrolux, the standard brands on this market range in price from £13 to £25, prices at the coast ports being about £1 lower per machine.

The following retail-price information should afford an idea of competitive conditions, but it should be remembered that in many instances substantial cash discounts are allowed.

COMPARATIVE PRICES OF COMPETING VACUUM CLEANERS, JOHANNESBURG, UNION OF SOUTH AFRICA

Trade name	Retail list price	Terms
	£ s. d.	
Regina	15 15 0	Plus approximately 8s., on terms.
Tellus (small)	13 2 6	
Tellus (large)	14 12 6	
Orion	12 12 0	
Vactric	13 13 0	
Magnet	14 14 0	
Vampire	15 0 0	
Electrolux	18 18 0	Less 15 to 5 per cent for cash in 10 days.
Electrolux	21 0 0	Terms, £1 down and £1 per month.
American product	14 10 0	Less 5 per cent for cash.

FLOOR COVERINGS, HANGINGS, ETC.

Both the construction and the furnishings of typical South African homes are noticeably different from those familiar to the average resident in the United States. Hardwood floors are the exception, and with the almost universal use of cheap pine flooring has come a tendency to pay far less attention to the floor and floor coverings than is customary in the United States and other countries. There is a considerable sale of hard-surfaced floor coverings, such as linoleum, which is used to completely cover the floor space. The use of carpeting, rugs, and soft floor coverings is, however, fairly widespread. Persian, Wilton, and other types appear in the homes of the financially able, and cheap woolen, rayon, and fiber rugs, all chiefly of continental origin, are used in the homes of those with average and below—average incomes.

Furniture, most of it manufactured in South Africa, is covered with a variety of materials. Damask, pile fabrics, tapestry, and artificial leather are the principal upholstery coverings utilized. Damask is the most popular, and, according to trade opinion, the average annual sales of that type of goods exceed all others. Rayon qualities supply most of the demand at present, and the combination of blue-and-silver or blue-and-gold color schemes, portraying strikingly vivid designs, are being used.

Tapestries and pile fabrics, according to trade informants, are used to some extent by the furniture manufacturers and are slowly encroaching on damask sales, the better classes of furniture now being covered with material of that class. Though price is of considerable importance, that factor does not occupy such a dictating position as in the cheaper-coverings trade.

Hangings are similar in type to those in the United States, with, perhaps, a greater use of rayon and lightweight draperies. Netting and similar materials have been very popular among the "average-income" groups.

The interior finish of automobiles that is popular at this time is the smooth-leather or the artificial-leather covering; replacements usually follow the original covering scheme. Pile-fabric covering, though to be found in a number of closed cars operating in this locality, is usually considered rather warm for use in areas where high temperatures are common and where dry and dusty conditions are encountered. The major portion of imported pile fabrics are therefore diverted to the furniture and furnishing trade, and even sales "over the counter" are believed to exceed sales to automobile upholstery firms.

DISTRIBUTION METHODS

In general, electrical household appliances in South Africa are handled direct through electrical dealers. A number of the leading oversea firms—American, British, and German—have their own wholesale branches in this country, but the bulk of sales are effected by comparatively small houses specializing in electrical equipment. Many of these are establishments developed as side lines by electrical contractors. Others, particularly in the smaller centers, are sections of hardware establishments and general stores. As ample stocks must be carried to compete adequately, this business differs from the practice in most lines in South Africa for which the services of a manufacturers' agent are essential.

The house-to-house method of distribution has been effective to the point of placing vacuum cleaners in the houses of a percentage of the population, but several difficulties are encountered. The limitations of the market are further accentuated by the prevalence of cheap native labor and the tendency of the South African housewife to place all cleaning operations in the hands of a low-paid "house boy." There is no parallel between the average South African's interest in the home and that of the American housewife. Native household servants are available in abundance practically everywhere—and, except in the Cape Town urban area, men servants—at a cost so low that the use of the machines under discussion is rarely even considered as a substitute for hand labor. Furthermore, the natives are not only willing to do the work by hand, but have little aptitude or desire to avail themselves of machines. It accordingly becomes necessary to sell these appliances on a basis of other than labor-saving considerations.

The house-to-house method is perhaps the most effective for obtaining actual sales; for introductory work it may be used to advantage, provided a satisfactory organization can be established and a careful selection of prospects be made.

PROSPECTS

It does not appear that the chances for additional American firms in this market are encouraging at this time. The companies with branches or distributors in this country are not believed to be operating on any substantial margin or profit, owing to the intense competition, and it is doubtful whether the laying down of stocks here by other firms and the expenses incident to opening up in this country would be fully justified. These costs should be carefully considered before any definite action be taken. With the present overcrowded condition of the market, intensive educational work must be undertaken before the consuming public will demand the apparatus. Then, too, some difficulty is certain to be encountered in interesting capable distributors in handling vacuum cleaners not already on the market, unless there is some striking advantage in price, operation, etc. It is regarded as essential that in making a very thorough canvass among dealers it will be difficult to interest the more capable type without a demonstrating machine or without their having full details as to the prices, discounts, and other similar information.

HEATING AND COOKING APPARATUS

HEATING

Relatively little attention has been paid to the installation of heating facilities, and basements or other provisions for the future installation of a heating plant are seldom included in construction plans. Perhaps less than 1 per cent of all buildings in the Union of South Africa contain central heating plants of any description, nor has there been any evident demand to include such equipment generally in new residences or buildings or in old houses.

A few of the more recently constructed office buildings, possessing the appearance of modernness, have been equipped with central heating plants, usually hot water or steam operated. A small number of newly built apartment houses depend on central heating systems, but, as a rule, office buildings, flats, and residences utilize small fireplaces and coal grates for heating purposes. The fact that a recently established knit-goods factory, equipped with central heating, is reported to be the only textile factory in South Africa possessing such facilities indicates the general lack of heating facilities of that character in connection with industrial plants.

CLIMATIC CONDITIONS

Temperature.—The Union of South Africa is situated between the rather low latitudes of 22° and 35° south, but its climate is cooler than that of similar latitudes in the Northern Hemisphere. Statistical tables indicate a general uniformity of mean annual temperature over the greater part of the Union, due, it is believed, to the plateau structure. The warmest place in South Africa is found in the Transvaal on the border of Mozambique (Portuguese East Africa) at an elevation of 460 feet above sea level, where there is a mean annual temperature of 73°; the coldest spot is on Table Mountain, Cape Town, some 2,496 feet above sea level, where a mean annual temperature of about 54° is registered. Cape Agulhas, the most

southerly point in latitude 34° 50′ south and 55 feet above sea level, has a mean yearly temperature of 61.5°; Johannesburg (Joubert Park), in the Transvaal high veld in latitude 26° 11′ south and at an elevation of 5,750 feet, has an annual temperature of 60.6° F., a difference of only 0.9°. Again, considering the two capitals: Cape Town at the southwestern extremity of the country, in latitude 33° 55′ south and at an altitude of 115 feet, has an average of 62.6° F.; Pretoria, situated in a shallow valley in latitude 25° 45′ south and at a height of approximately 4,400 feet, has a mean temperature of 63.5°. These temperatures are practically the same as the summer temperatures of England and about the same as those of many of the best-known health resorts of the Mediterranean.

These mean temperatures do not serve to indicate completely the general demand or need for heating apparatus; one must consider the temperature extremes as, despite the uniformity in yearly temperatures, there is a considerable diversity of hot and cold weather. Mean maximum temperatures of 90° and over are confined chiefly to the three months of December, January, and February, and are encountered in Natal, the eastern low veld of the Transvaal, the northern border of the Cape Province, and the west coastal section of the same Province. There is a more or less general lack of extremely low temperatures, but occasionally temperatures as low as 10° or 15° F. occur inland between the months of June and September, and some sections are known as frostless belts. Continuous fires are seldom required for a period longer than two months, and often the midday sun warms up the atmosphere so that no fire is needed during the day.

Heating season.—The short heating season prevailing in most sections of South Africa offers a serious obstacle to a marked extension of large heating installations, there being no need for a continuous heat supply over an extended period. In some parts of the Union, during the winter months fires are required rather consistently for a stretch of weeks—Cape Town and contiguous sections in particular. All rooms do not posses fireplaces; as a rule the living room (lounge), one bedroom, and the dining room are the only ones usually equipped with such heating facilities. The climate in Johannesburg is exceptionally dry, and the cold is aggravated only on occasions by high winds; but in Cape Town cold, damp, windy weather often produces a sharp penetrating atmosphere.

MARKET FOR ELECTRIC HEATERS

The average house is rarely equipped with a fireplace in every room, and electric heaters have a fairly good sale. The bull's-eye or bowl reflection type is the most popular, though grate heaters are sold to some extent. The necessity of special wiring for many of the latter, together with the fact of their much higher initial cost, appears to militate against their more extensive sale. No separate statistics are compiled with regard to the importation of heaters, but reports from the trade would indicate that the Germans lead in this field, with the British second and America third. The German Degea is said to be the cheapest and most popular make on the market, followed by the A. E. G. (German), Magnet (British General Electric), Promethus (German), Revo (British), and Creda (British). Only two American makes, according to trade advices, are now being marketed here, and neither of them has been able to compete on a price basis with the cheaper lines coming from Germany.

DOMESTIC WATER HEATERS

Domestic water heaters are little used and are not commonly installed as separate units, since dependence for hot-water supplies is ordinarily placed on the cooking range. Ranges in most houses are fitted with water backs of sufficient capacity to supply water for both kitchen and bathroom. Whenever a supplementary hot-water supply is necessary one of the several locally made wood or coal hot-water heaters is used. Homes equipped with electric ranges or gas stoves and possessing no coal range install the coal or wood burning heater or sometimes an electric or gas heater. A few Moffat (Canadian) water heaters, including a cylinder of 20 gallons and retailing for £15 10s., are being sold in Johannesburg, but the relatively high cost of electricity somewhat retards normal sales developments. However, with increasing electricity supplies, coupled with municipal buying assistance, sales may in time be somewhat accelerated. It is estimated that in Durban, where current is cheaper than in most parts of the country and special efforts have been made to encourage their use, there are some 4,000 electric hot-water heaters. Their increase in popularity is indicated by the installation of over 700 in 1929 as compared with 324 in 1924.

COOKING APPLIANCES

The universal use of native domestics offers one serious obstacle to a general improvement in cooking and heating facilities for the average householder. Some of the more prosperous families employ white cooks who demand somewhat better arrangements and who are competent to operate the more up-to-date appliances and apparatus; but, as a class, they are limited and exercise only a small influence on sales of electric ranges and stoves.

On the other hand, cheap native kitchen help favors the simple wood or coal range, and most of the houses in urban South Africa are so equipped. Electric stoves, and gas stoves in particular, are somewhat complicated from the native's viewpoint, though under their more widespread use the negro cook boy is becoming more accomplished in the matter of operation. But some housewives are loath to commit the care of high-priced electrical appliances to native and colored servants. The coal-burning range makes no demand on their intelligence, is familiar to them, and they prefer it to any convenience and labor-saving advantages afforded by ranges and stoves operating on some other principle.

In addition, the housewife has little interest in either the convenience or labor-saving features of competitive apparatus, since she spends considerably less time in the kitchen than her American counterpart, turning over most of the cooking duties to the cook boy, whose wages are very low and on whom the demands for cleverness are not very heavy. This general attitude greatly retards the movement toward modern equipment of kitchens; the great advance made in that direction in the United States has no parallel in South Africa.

RANGES AND APARTMENT-HOUSE COOKING APPLIANCES

Electric ranges are becoming somewhat more popular throughout the urban districts, particularly where cooking current is available at a low cost per kilowatt-hour. The growth in the number of apartment houses throughout the Union also has provided an excellent outlet for electrical household devices of various kinds, so that cook stoves, and to some extent hot plates, have experienced an accelerated sale. The past few years have witnessed marked activity in the construction of apartment dwellings and, as many of the better type buildings of this character are equipped with electrical cooking appliances, the increase in sales may be attributed largely to this development.

COMPETITION

It will be noted from the following statistics that in 1927 the United Kingdom occupied the leading position in the heating and cooking apparatus trade, with Canada second, the United States a poor third, and Germany fourth. Canada has ousted the United Kingdom from first place and assumed the leadership. Reports from various trade sources as well as the import statistics indicate that American suppliers, after a relapse in 1927, have again regained their lost ground, and that Germany is also forging ahead, mainly at the expense of the British, with the Moffatt, Guernsey, and McCrairy occupying first, second, and third positions, respectively, followed by the Magnet, manufactured by the British General Electric. Three American stoves, according to trade advices, come fifth, sixth, and seventh, with Moore's—another Canadian product—in eighth place.

The remainder of the trade is largely distributed among several British makes, including the Reve, Tricity, Carren, and Falcon; one Swiss, the Thalma; and three or four German lines.

IMPORTS OF ELECTRICAL HEATING AND COOKING APPARATUS INTO THE UNION OF SOUTH AFRICA, 1925–1928

Country of origin	1925	1926	1927	1928
United Kingdom	£23,927	£35,450	£33,917	£38,018
Canada	1,324	15,194	25,156	44,231
Denmark	154	18	38	404
France	159	200	293	148
Germany	5,765	5,760	9,049	13,838
Netherlands	98	47	40	246
Switzerland	78	33	629	2,576
United States	3,843	12,345	9,814	18,499
Others	158	252	1,538	398
Total	35,506	69,299	80,474	118,358

TYPES IN DEMAND

A wide range of models is sold on this market, retail quotations in Johannesburg ranging from £18 to £33 for the popular types. A number of models sold on this market follow the American practice of placing the oven at the side, but the majority, it is believed, have the oven beneath the cooking plates. Covered elements are essential

owing to the careless type of native servants employed in this country; one of the chief objections to the use of electric stoves is the replacing of elements. Hot plates are not in great demand; for such market as does exist, it is understood that American manufacturers largely monopolize the trade.

MUNICIPAL ENCOURAGEMENT

It would appear that the initial cost of electrical stoves is one of the most important drawbacks, and it is for this reason that those cities fostering an "assisted payment plan" have made the most progress. Since 1924 the Durban municipality has been endeavoring by various means to increase the domestic consumption of current, and to that end has fostered the sale of electric stoves and of water heaters in particular. As a result the number of stoves installed in the city increased from 228 in that year to about 1,400 in 1929. This is more surprising when one considers the added cost of installation. When a stove is installed in Durban the city increases the size of the service wires without charge, but the consumer or owner of the house generally must increase the size of his mains, at a cost varying between $38 and $75. This heavy charge, combined with the cost of the stove, even on the installment basis with its minimum of $30, makes the installation of electric ranges an expensive proposition. It is estimated that there are about 6,000 electric ranges on the Durban circuits.

Among the important cities Johannesburg continues to lag in this respect, the authorities showing slight inclination at this time to encourage the domestic consumption of electricity, for the alternating-current supply is already overtaxed and, besides, they are more concerned with the sale of gas produced by the new plant recently put into operation.

DISTRIBUTION REQUIREMENTS

Efficient representation and distribution have been the most influential features of the successful introduction and subsequent sale of the electric heating and cooking apparatus that finds favor at this time. Dealers carry models in stock and substantial stocks of spares. In the matter of successfully selling and keeping sold electric heating and cooking apparatus of all types, too much emphasis can not be laid on the matter of spare parts and service availability. Manufacturers should insist that all stores and purchasers, retail or wholesale, carry an ample supply of parts so as to render reasonable service. Trade contacts, when questioned on this subject, invariably support such a theory, and point out that the failure to secure a substantial volume of sales on the part of some makes may be traced to the failure to observe such fundamentals; it is maintained that some makes have registered a falling off in sales as a direct result of lack of such facilities on the part of the selling organization.

CREDIT TERMS AND QUOTATIONS

Orders from dealers are ordinarily sent and confirmed through London or New York shippers. Accounts are usually paid cash against documents or at periods mutually agreed upon, the time vary-

ing from 30 to 120 days. German manufacturers are reported to be the most liberal competitors in the matter of terms, the 120-day period being often employed, but American and English suppliers, in most cases, where orders are accepted direct from the dealer, demand cash against documents.

Quotations, as a rule, are requested f. o. b. New York, London, or other ports. C. i. f. quotations are the exception, though occasionally dealers demand the latter information, which is then supplied by cable; but usually f. o. b. port of shipment is sufficient.

PACKING

A number of prominent dealers in stoves and ranges in South Africa have expressed the opinion that one of the most important details to which manufacturers might give attention is the proper packing of models for oversea shipment. In some cases the packing has been insufficient; in others too much packing material has been used and thereby has involved excess freight and handling charges. Dealers and agents point out that not only are freight rates and rail rates very high in this market but that excessive packing increases these charges to a considerable extent.

Internal security in packing electrical stoves and heating apparatus is an important consideration. A local agent for an American electric stove, in lodging a packing complaint, definitely ascribed the damage to the movement of stoves within the packing cases rather than to the character of the case. He reported that after 1926 practically every shipment arrived in somewhat damaged condition; that the manufacturer, in his steady endeavor to eliminate the in-transit damage, had directed his efforts chiefly toward constructing a heavier outer case, whereas the damage resulted from the stoves becoming loose inside the case. Gradually, however, improvements were made and, chiefly through the use of soft inside packing, most of the damage was finally eliminated.

Recently, however, with the advent of crate packing for shipment within the United States, the oversea methods have been altered. Later shipments to South Africa have consisted of the assembled stove packed in a crate as for the domestic United States trade, and around it a heavy case of three-fourths-inch boards. Not only have these stoves worked loose inside the cases and arrived in badly damaged condition, but the shipping costs have been increased by the added weight and cubic space; the average weight per case has been increased to 300 pounds and, owing to the assembled state of the stoves, considerable waste space is inclosed by the shipping case. In this connection, the complaining agent made the following statement:

> I have been trying in vain to get manufacturers to try shipping the stoves with the whole top hot-plate grill detached and packed with the splasher backs, also detached, in a separate case. The dozen grills would probably go into one case, and then each stove body could be fitted compactly into a small case which would not cause damage. A case weighing 300 pounds can not be handled by two men, save by end-over-ending (I have seen draymen push the case to the edge of a lorry and give it a push to the sidewalk, 3 feet or so below); as the heavy box strikes the ground the loosened contents inside get battered out of shape. American kitchen cabinets have arrived here in perfect condition, when packed in cases of light boards not more than three-eighths-inch thick with an interlining of corrugated paper. The lighter case permits it to be handled more easily, and so it gets less bumps.

ADVERTISING

The principal mediums used in the advertising of electrical cooking and heating apparatus in South Africa are newspapers and magazines. Dealers, department stores, and other retail outlets handling stoves and ranges in the cities of the Union usually prefer press advertising, at times inserting special single displays and on other occasions including the stove items among other commodities advertised. Often an entire page of an important paper will carry electrical stove and heating advertising copy, placed by independent dealers acting frequently in cooperation with the municipal electrical department. On the whole, the press advertising may be considered as relatively extensive; it is supplemented by catalogue, leaflet, and other descriptive matter supplied by the manufacturer.

Special allowances to dealers.—Representatives are always anxious to obtain advertising assistance from the manufacturer in the form of a special allowance, particularly during the introductory period or during intensive competition; but such aid is not always forthcoming. One electric-stove manufacturer, it is reported, endeavoring to establish his product on the market, has undertaken to furnish his representative, free of charge, all electros, window cards and trimmings, transparencies, and descriptive literature for distribution throughout the country. In addition, he agrees to contribute to a year-round campaign, in the most effective newspaper and journals, an annual amount equal to 5 per cent of the total year's sales, this amount to be forwarded to the agent quarterly on receipt of original receipted bills showing insertions in publications. This type of assistance is usually regarded by the agent as satisfactory.

Journals and other mediums.—There are no trade journals devoted to electrical heating and cooking apparatus alone, but The South African Builder, a monthly magazine issued by the National Federation of Building Trade Employers in South Africa, circulates among architects and members of the building fraternity and is frequently employed to advertise commodities likely to interest that class of readers.

There are also a few general magazines that are employed by dealers in various types of domestic apparatus and appliances to carry the advertising message to the housewife; among these are The Cape; South African Gardening and Country Life; The Outspan; South African Lady's Pictorial; and South African Woman's Weekly (supplement to Natal Mercury).

Detailed information regarding these journals and other available advertising mediums may be obtained from the specialties division of the Bureau of Foreign and Domestic Commerce, Washington, D. C. It should not be interpreted that these mediums are recommended above all others or that they constitute the only mediums available. A definite advertising plan should involve the advice and assistance of a competent advertising agency.

HOUSEHOLD REFRIGERATORS

With the development in the domestic-appliance trade has come an increase in the sale of electric refrigeration units. Special propaganda and intensive cultivation of the market by manufacturers is reflected in the greater number of homes in which mechanical refrig-

eration has been installed, though the potentialities of the market have not been fully tested. Nevertheless, although progress lately has been relatively good, it can not be said that sales are extensive, nor is there a widespread appreciation of the advantages of electrical refrigeration. The advertising campaign and intensive sales efforts made by the distributors have been effective mostly in arousing the interest and educating the consumer. The leading journals and newspapers have been carrying good-sized advertisements of three well-known American makes, and it is evident that these lines have been greatly pushed during the last year. In the year ended March 31, 1929, there were 260 electric refrigerators installed in Durban, or an increase of 72 per cent over the preceding year.

LOCAL CONDITIONS

The general demand for ordinary household refrigerators is relatively good in those cities where an ample ice supply is available. The distinct economy in buying food in quantities is thus made possible, and a number of housewives have taken advantage of such procedure; but the practice, although growing, is believed to be still limited.

The consumer is served at the door by hucksters who carry a wide range of perishable vegetables and such products, and usually one or two days' supply is purchased. These hucksters make a practice of calling on the housewife regularly and, although their prices are considerably out of line with produce purchased in quantity at the municipal market, the convenience factor is most influential. There is, too, a consistent use of household refrigerators for milk, butter, and other perishable goods in cities where ice is available. These refrigerators are supplied by local house-furnishing stores to a considerable number of persons, but the use of ice or cooling elements is in no way comparable to household practice in the United States.

It is not possible to determine, from official import statistics, the exact number or value of electrical refrigerators or those of the household type imported, since a proper segregation is not made in the records. However, in 1927, the United States exported direct to South Africa 836 refrigeration sets (up to 1-ton capacity) valued at $184,927; in 1928 the respective figures were 888 and $201,080.

Among Canadian ice refrigerators the Brantford is easily the most popular and is quoted f. o. b. Brantford, Canada, at $17.50 for apartment style and size (measurements from catalogue) and at $21.40 for side-icer enamel (measurements from catalogue). Small metal household refrigerators are appearing in some quantity and are selling well in the smaller apartment sizes. Houses not equipped with refrigerators usually have small "safes," or compartments, located in pantries or protected spots where there is a circulation of air but no sunshine.

COMPETITION

In the mechanical-refrigerator line, some half-dozen makes are competing for their share of the limited market, with four makes accounting for almost all the sales. American units are easily the most popular, though the English Electrolux, sold through an extensive house-to-house system, is making good progress. Some months ago two American makes held undisputed possession of first and

second places in the matter of sales, but lately there has been intense activity on the part of a third American line, which has been well received, and the position of the leaders has been challenged.

The British Electrolux, selling in one model for as low as £34 in Johannesburg, benefits from the advantage of this price quotation, which is much less than leading American makes retailing from £50 upward. At the coastal points they may be sold at still lower figures as the inland freight rates are very high. The Electrolux manufacturers, who also manufacture vacuum cleaners, have established their own sales organization in South Africa and conduct a very successful direct-to-consumer business in their several lines. In this connection they maintain selling branches in the most important cities of the Union.

Competing makes are usually sold through exclusive distributors in various cities. Installment privileges are very important as a sales factor, for very few units are sold for cash. The Electrolux terms are very liberal, with payments usually extending well over a year.

SMALL LINES

ELECTRIC IRONS

Of the whole group of small electrical appliances, electric irons have, it is believed, found the widest use and are sold in greatest quantities. Nevertheless, only a relatively small part of the total number of homes are equipped with this modern device, the old-style flatiron being still the popular item; but with the increase of electric-current service and continual sales effort on the part of dealers, the city housewives have purchased in increasing quantities. Ordinarily, however, they are loath to place electrical labor-saving apparatus in the hands of the native boys, who do the cooking, house, and laundry work, but there appears to be a tendency to overcome this feeling and to turn over to them the electric iron, especially when it is equipped with a thermostatic control. It should be remembered, however, that the universal use of native help in the house is a very strong retarding influence on the sale of all electrical goods of this type.

It is impossible to state the annual volume of sales, as there are no segregated import statistics nor can any reliable estimate be made. The potentialities of the market may be inferred by reference to the section dealing with vacuum cleaners (p. 30).

There are a number of makes of irons competing strenuously for the limited amount of business and, although there are no official records available to show the relative importance of oversea sources of supply, interviews with the trade indicate that the United States supplies more irons than any other country. Two well-known makes of American irons are relatively popular, the demand being influenced by their superior finish and strong construction. Foremost among others competing with these lines are the German Degea and the British Magnet, both sold in substantial quantities in the larger cities.

Exporters of electric irons destined for South Africa should ascertain from the electrical equipment division of the Bureau of Foreign and Domestic Commerce, Washington, D. C., the voltages of municipal current available in the principal cities of the Union and should equip them with appropriate elements as well as proper connections.

TOASTERS, PERCOLATORS, KETTLES, WAFFLE IRONS, ETC.

Electric toasters are employed to some extent, but in no way can their use be termed popular. The well-established custom in the United States, whereby fresh, hot toast is made at the table, does not prevail in the average South African household, and the use of electrically connected apparatus operating during the meal is an exception. Trade opinion places two sturdy and attractive American toasters as leaders in popularity, with the British Magnet, the German Degea, and the Canadian Superior following in order. The Canadian product has made very good progress of late, as it can be retailed in Johannesburg for about 18s. 6d. and allow for a fair profit to the dealer, as compared with approximately 37s. 6d. for American models. Some cheap German toasters have been in evidence and, though making fairly good progress on a price basis at first, are understood to have fallen off in sales recently.

In South African urban centers where domestic current service is more easily available, tea is the national drink; coffee is not the popular beverage that it is in the United States, and for that reason the sale of electric coffee percolators is not so large as might be expected. Coffee is considerably more popular in the rural districts among the Dutch residents, but only in relatively few instances is electric current available

Tea being served in the home and office from two to five times a day, there is frequent use for a quick supply of hot water, and electric kettles are perhaps among the best sellers in the small electrical-appliance group. American kettles are not prominent, the trade being dominated by British and German goods. The British lines well known in the market are the Oneida, Premier, and Creada; the German makes include those distributed by the A. E. G., Promethus, and Degea. The 2-pint copper kettle retailing in Johannesburg for about 23s. is a popular item, though there is a sizable demand for 1½-pint and 3-pint sizes in both copper and nickel.

The demand for waffle irons is very small, and their sale is limited almost entirely to American makes. The trade in grills is also very restricted, with cheap German lines, British and Canadian grills supplying the limited demand. Sales of kitchen apparatus, such as egg beaters, mixers, etc., operated by small motors, are negligible and directly retarded by the native-help situation.

ELECTRIC FANS

There is, on the whole, a limited sale of electric fans in South Africa in spite of the fact that some sections suffer from heat over a period of several months every year. Places having a yearly temperature of 70° or over and suffering from high temperatures are confined chiefly to the coastal area of Natal and Zululand, together with the low veld in eastern and northern Transvaal. As far as temperature is concerned the Union possesses a climate well adapted for comfortable living, but conditions in the urban centers have usually to be aided by the use of electric fans during nine months of the year. Mean maximum temperatures are usually experienced in the period December–February.

Electric fans are confined chiefly to public places, such as hotels, restaurants, tea rooms, theaters, and similar establishments, which

more often employ large ceiling fans in preference to desk types. The latter are making a slight progress in sales for office use, where the 14 and 16 inch sizes are the more popular. Electric fans are seldom seen in the South African home, and that field accounts for very few of the sales being made at this time.

Some low-priced German fans are on sale and have made a little progress on the market, but it is believed that British fans lead both German and American products.

MUNICIPAL AIDS TO PURCHASE

That the progressive municipalities of the Union are cognizant of the benefits of increased sales of current to householders is evidenced by the action taken by several to make the purchase of certain appliances easier through assisted-purchase schemes.

DURBAN

Durban has made the greatest progress in the matter of promoting the installation of electric stoves and water heaters, by making possible the purchase of these appliances through an installment-purchase plan.

Assisted-purchase scheme.—The Durban electrical engineer describes the assisted-purchase scheme supported by that town, as follows:

> The town council does not itself purchase or stock stoves. The consumer may buy whatever make of stove he pleases from a number available locally, but all of these must obtain the approval of the department and its certificate before the stove can be sold under this scheme. There are now 13 different makes of stoves available, chiefly of English and Canadian manufacture, but one locally made stove is included in the list. The municipal corporation pays the supplier outright for the stove as soon as it is installed.
>
> A supplier is permitted to make up to 25 per cent profit above landed cost, £2 being allowed above this landed cost as expenses for assembly, delivery, etc., so that a stove which he can land for £18 is taken as costing £20 sold, and he is allowed to charge £25 for it. He must produce supporting documents to the town treasurer in regard to his costs. The purchaser then makes payment to the town treasurer on the first of every month, installments covering from one to three years; the agreement stipulates that if he is behind in his payments for the stove the council has the right to cut off current.
>
> This proviso, together with the fact that two sureties must be provided for the due fulfillment of the contract (and these must be registered male property owners), has prevented any loss to the town council, although the total amount advanced since the beginning of the scheme exceeds £90,000. The amount at present outstanding is under £30,000 and is more or less stationary, as expiring contracts just about counterbalance new contracts being entered into. The municipal corporation charges 6 per cent interest on outstandings, and as loans are at 5 per cent, the difference of 1 per cent is available to cover clerical expenses.
>
> In regard to service connections and wiring, the department increases the size of the service wires when a stove is installed, without charge to the consumer; but it is generally necessary for the consumer to increase the size of his mains, and the cost of this work is usually fairly heavy, varying from £8 to £15. The consumer is allowed to pay for this also in installments if he is a property owner. The minimum initial installment for the stove available under the scheme is £6.

Local use of current.—According to recent statistics, the amount of electric current used in Durban in the year ended July 31, 1929, marked a new record in total units consumed. The number of kilo-

watt-hours sold for various purposes equaled more than 80,700,000, as compared with 69,858,629 in the year preceding, or an increase of over 15 per cent. It will be noted from the following table that corporation lighting and power registered the only decline, and that private lighting and heating showed the greatest advance.

ELECTRIC CURRENT USED IN DURBAN, SOUTH AFRICA, 1928 AND 1929; BY CLASSES OF CONSUMERS

Class of consumer	Kilowatt-hours sold, year ended July 31—		Per cent increase (+) or decrease (−)
	1929	1928	
Private lighting and heating	37,843,976	30,177,558	+25.4
Private power	22,780,940	20,494,727	+11.2
Corporation lighting and power	2,032,126	2,050,958	−0.9
Street lighting	2,371,720	2,048,459	+15.8
Tramways	6,652,799	6,596,431	+0.9
Government lighting and power	9,051,935	8,490,496	+6.6
Total	80,733,496	69,858,629	+15.6

The use of electricity for domestic cooking and heating increased more than 32 per cent during the year 1927–28, which reflects the effect of the 1,339 electric stoves installed during that year. Electric-refrigerator installations increased 72 per cent, 260 being placed in operation as compared with the preceding year. A special fund of about $1,000 has been appropriated to popularize the use of thermostatically controlled water heaters, giving an unlimited supply of hot water at all times and at a very moderate current consumption, and also providing a more even load from the supplier's point of view than is the case with the ordinary type of water heater. This progressive movement in the use of household cooking and heating devices is attributable in considerable measure to the "assisted purchase" scheme conducted by the municipality. It is estimated that about 3,000 agreements have been consummated with consumers since the inception of the plan, and that about 50 per cent of the electric stoves installed are purchased in this manner.

PRETORIA

Pretoria operates similarly under an ordinance which provides for the city council to make advances of money to any owner of land within or without the municipality for the purpose of enabling or assisting him in the installation of plain-wiring electric or gas fittings and articles in or at his premises, provided that any one advance hereunder shall not exceed £50 without the sanction of the administrator—such sum to include the cost of the connection to the council's mains and every expense in connection therewith. A charge of 6 per cent interest is levied.

BLOEMFONTEIN AND CAPE TOWN

In Bloemfontein the council will pay any firm in the first instance, and the sum advanced is to be repaid over a period of two years at 8 per cent interest. The purchaser is required to pay a deposit equivalent to one-third of the cost, and a hire-purchase agreement is entered into with the council. The council also puts in a suitable meter and heavier wires from the main to the meters free of charge.

Cape Town has been prominently identified with the "do it electrically" movement and has provided for consumer assistance.

CIVIC ENCOURAGEMENTS

In addition to municipal efforts the Association of Municipal Electrical Engineers of South Africa is expected to initiate plans to develop an increased use of electric current in the houses of the Union. This, if successfully carried out, should greatly stimulate the sale of electrical household appliances. Plans are only in the initial stages of development, and it will be some time before tangible results are obtained.

It has been proposed that an electrical development association be formed, with headquarters in Johannesburg, to foster the development of electricity on a national basis by a scheme of national electrical propaganda. This proposal was presented by the chairman of the electricity supply commission at the Convention of the Association of Municipal Electrical Engineers at Bloemfontein on November 12, where it was heartily indorsed.

In his proposal the chairman pointed out that there is a more or less general lack of appreciation of the advantages of electrical domestic apparatus, due to the present construction of houses, the ample supply of low-wage native help, and other factors, all of which have restricted the development of the domestic load. In addition, in many cases the architect has failed to provide outlets of adequate capacity, so that a big upset becomes necessary before accessories can be installed. There is some prejudice against electric heaters, owing to the fact that as a rule electric heaters hitherto have been given small loadings, so that they do not adequately warm the whole room but are more suitable to individual application. As regards domestic water heating, electrical engineers have generally been somewhat conservative, as have the public, on account of the high operating costs.

It is expected that the new association will turn its attention to these problems, making suggestions to both architects and house owners of such weight as to compel attention concerning its views on both lighting and heating, thereby insuring a higher general appreciation of these electric services throughout the community. It may also influence the wider adoption of hire-purchase methods, assisted-wiring schemes, and the like.

ELECTRIC METERS

PREFERRED MAKES

Trade opinions indicate that the three most popular makes of electric meters in South Africa and Southern Rhodesia are (1) Chamberlain & Hookham; (2) Ferranti; and (3) Siemens. Although there is no means of substantiating this statement, a census of meters in 36 towns and cities seems to bear it out. Of course, several different makes of meters are used in many of the cities, and only a few of the smaller towns have thus far limited themselves to one particular make; but out of the 36 towns and cities reporting, 29 stated that

Chamberlain & Hookham meters were installed in their system, 25 recorded Ferranti meters, and 13 specified Siemens. It was customary for at least two or more types to be reported, and the most frequently paired were Chamberlain & Hookham and Ferranti; however, three towns specified the former only, and two mentioned the latter only.

Durban has awarded a contract to the Metropolitan Vickers Electrical Co. for 1,000 single-phase consumers' watt-hour meters, 200 volts, 20 amperes, at £1 1s. each; and 1,000 of 50 amperes, at £1 6s. each.

In the merchandising of meters it should be remembered that exhaustive tests are made by municipal authorities before the meters are placed on the approved list and the final purchase made.

IMPORTS AND THEIR SOURCES

The principal oversea sources of electric meters imported into South Africa are shown in the following table:

SOUTH AFRICAN IMPORTS OF ELECTRIC METERS

Country of origin	1925	1926	1927	1928
United Kingdom	£21,503	£26,140	£15,586	£15,103
Germany	5,407	5,623	2,507	8,178
Switzerland	397	178	1,914	2,793
Canada	259	46	445	1,444
United States	928	1,351	1,437	556
Others	197	248	112	401
Total	28,691	33,586	22,001	28,475

An analysis of these figures reveals that the United Kingdom, though still the leading supplier, has had her leadership substantially reduced within the past two years. In 1928 the United Kingdom furnished 53 per cent of the imports (by value); Germany, 29 per cent; and Switzerland, 10 per cent. The 1927 imports from the United States, amounting to 6½ per cent of the total, dropped sharply to 1 per cent of the total in 1928.

ELECTRICAL COMMUNICATION

RADIO BROADCASTING

The transmission by radio of programs of entertainment and of educational character, to be received by the public, has for some years been carried out in South Africa with varying success. At present, radio broadcasting in South Africa is in the hands of a private organization, the African Broadcasting Co. (Ltd.); by reason of its contract with the Minister of Posts and Telegraphs and subsequent arrangements, it virtually controls broadcasting in the Union. Through its direct association with the African Theatres (Ltd.), entertainment of a popular sort is available and has already been included on the broadcasting programs.

The Union is served by three broadcasting stations located, respectively, at Johannesburg, Cape Town, and Durban. The most

powerful is the new station at Johannesburg, some 900 miles northeast of Cape Town and about 500 miles inland and northwest of Durban. This station is regularly received during daylight at 400 miles and during the night at 1,000 miles, whereas the two coastal stations are received regularly at a maximum of 100 miles and 600 miles during day and night, respectively.

Broadcasting is supported by an annual license fee of 10s. ($2.43) on each receiving set, but the income from this source is not sufficient to pay for operations. Less than 20,000 persons are now registered as listeners in the Union. There are, in fact, a greater number of receiving sets in use, as piracy in listening-in has not been entirely stamped out and all present listeners are not registered.

The African Broadcasting Co. is considering a special effort to establish broadcasting once and for all on a sound basis in South Africa, and to this end will soon embark on a widespread advertising campaign to further the interests of radio. It has already come to a provisional arrangement with wireless dealers by which they will assist in this campaign to eliminate pirates. The advertising campaign to be inaugurated is based on the cooperation of the broadcasting company, the importers of wireless goods, a gramophone record company, and the public.

Some importers have agreed to cooperate with the African Broadcasting Co. in the endeavor to eliminate pirates, increase the number of listeners, and generally to further the interests of broadcasters so that the business might be established on a better basis in this country.

RECEIVING SETS

There is a noticeably inactive market for receiving sets at this time, but the purchase of various component parts for the building of sets or for replacement is carried on to a comparatively greater extent, especially in American products of novel yet proven quality.

The radio public has not reached the point where it requires the same fineness of detail and luxuriousness of appointment in radio sets as are commonly in demand in the United States. The entire history of radio in South Africa is paralleling in many ways that of the United States of several years ago, and the natural transition from crystal to tube sets has already taken place.

A few of the more elaborate tube sets are to be found in stock in some of the local retail establishments, but in general these are sold to the more prosperous individuals; the principal demand for tube sets appears to be for relatively inexpensive sets of two or three tubes. One dealer has intimated that a 2-tube set retailing for around $30 might be well received if subsequent developments in the radio field are favorable.

COMPETITION

Quite a number of American makes are already on the market (possibly more than the market justifies); in addition, British products are meeting with popularity, and a few German makes also are encountered. The British instrument in particular seems to have taken the fancy of a portion of the purchasers, chiefly on the basis of simplicity of operation, and is imported as a unit or assembled in South Africa. As explained by the local distributor who handles

American, German, and British makes, the operation of only three broadcasting stations in the Union makes the finer adjustments of the American models unnecessary; the relatively simple adjustment of the British model therefore favorably influenced its popularity. The single-dial set is meeting with approval in some quarters. Another dealer interviewed stated that he was concentrating on a 6-tube American set and was going to restrict his imports to such types. It is believed, however, that this dealer reaches a limited class of purchasers only, and his sales are not necessarily typical.

In addition to competition from imported models, a domestic assembled product, selling for about £15 to £40, is on the market. African Broadcasting (Ltd.), in the endeavor to reach all types of purchasers, provides wireless sets in three classes, with a special financial arrangement involving the deferred-payment principle. A great number of locally made sets are in operation, and the prices for such sets made up by dealers vary greatly. The British Brandes set retails for about £18 to £28; a 3-tube Rhenartz-Grete set, complete with A and B batteries and cone loud speaker, may be purchased for £30; Burndept Portable, about £37; and Burndept 3-valve set, with cone loud speaker, about £41 10s.

RADIO PARTS IN DEMAND

The radio receiving set components appear to offer greater relative possibilities in this market. Both the individual radio enthusiast and the dealers watch very closely the advertisement and periodical references to new and successful radio inventions in the United States and maintain a special interest in American developments. There is ample opportunity for local amateurs and craftsmen to purchase essential components of receiving sets and, judging from the stocks carried by retail stores and opinions of dealers, a substantial business is done in such lines. The supplies of German origin hardly appear to be in a class with the more finished and neater looking American and British articles. Some price difference in favor of the competitive European product is noted, but resales are carried on principally in the better American and British stocks. One local dealer estimates that 60 per cent of his sales are in American stock.

Transformers.—The better grade of transformers finds some sale, according to a well-informed member of the trade. This type of equipment is likely to meet with a moderate but more or less steady demand.

Loud speakers.—In the loud-speaker field the popular demand is developing along the cone or special lines. A few of the old-style horn speakers are in evidence in the local homes, and many still may be found on the shelves of the radio-equipment stores. This type of loud speaker, so common in the United States a few years ago, is, however, rapidly giving way to the cone variety. Of course, the de luxe complete sets, with self-contained sound boxes and resonators, are also to be found, but are relatively few in number.

Battery eliminators.—B and A battery eliminators for 200 to 240 volts, 50-cycle, have been pointed out as items with good potential sales. It is highly essential that these instruments be constructed for 200 to 240 volts, in order to meet local conditions.

Transmitters, pick-ups, and tubes.—Transmitting components of different sorts find a sale.

Pick-ups with adaptors encounter some demand, according to a local authority.

Some American tubes are already well known and have an excellent reputation. The British C and B tubes are prominent in local display. Other tubes found on sale are the Osram, B. T. H., Cosser, and Cosmos.

IMPORTS

The market is virtually dependent on imported products, and authoritative import figures should be of assistance in analyzing the prospects in South Africa.

In view of the inclusion of a variety of goods under the one heading, it is impossible to segregate radio receiving sets and components and thereby point to a definite trend in imports. It is believed, however, that the total values shown indicate in a general way the variance in imports of such products, though the statistics relating to individual countries do not so truly portray the actual portion of the market shared by each.

SOUTH AFRICAN IMPORTS OF WIRELESS TELEGRAPHY AND TELEPHONY INSTRUMENTS, AND APPLIANCES USED IN THE WORKING THEREOF

Country of origin	1925	1926	1927	1928
United Kingdom	£84,459	£44,553	£37,408	£59,918
United States	7,192	8,681	5,579	13,111
France	1,553	811	193	93
Germany	4,622	680	1,248	6,296
Netherlands	1,653	511	875	1,197
Denmark	1,762	850		
Others	1,134	80	230	3,147
Total	102,375	56,166	45,533	83,762

The imports of products from the United States under this comprehensive classification show a slow but definite trend upward from 1925 to 1928.

The dominance of British equipment is hardly as great as one might infer from these figures, as the large value of imports from the United Kingdom must contain considerable materials other than radio receiving sets.

DISTRIBUTION CONDITIONS

The distribution of radio equipment follows no definite channels, but a considerable amount is sold in South Africa through manufacturers' agents, who sell from samples on a commission basis. Most of the business which they secure is confirmed through either New York or London shipping houses, assuring payment in the United States for orders shipped. The varied types and classes of retail outlets common to the trade in the United States are not so pronounced in this market, and the chief business is done through electrical equipment stores, with some hardware stores sharing in the trade. The African Broadcasting Co. is organized to completely cover the Union, with branches in the main centers and subagents in

smaller towns. It is at present representing British, German, and American manufacturers.

It is not customary for the distributor to accept one line to the exclusion of all others, but as wide a variety is taken on as possible in order that no class of purchaser will fail to be served in this highly competitive market. Electrical-equipment houses and special radio-equipment firms are chiefly engaged in the distribution of receiving sets. The Philips Co. of the Netherlands has established its own branch in South Africa and lately has been very active.

In the selection of representatives, provision should be made for the satisfactory servicing of sets finally reaching the hands of the consumer. A wide distribution of servicing accommodations is one development which must parallel greater radio-equipment sales. The manufacturers who distribute their products through dealers must render a high order of service and cooperation to their representatives if they expect them to be successful in meeting competitive conditions.

There appear to be no special terms prevailing in the trade, but it is believed that a large number of local importers pay cash. Prices should be quoted c. i. f. South African ports or f. o. b. New York, a practice some American firms are reported to have failed to follow in the past. The market is highly competitive, and the niceties of the trade are usually effectively employed by successful manufacturers.

GENERAL OUTLOOK

Although some improvement in the general demand for radio equipment may be looked for in South Africa, one can not be too sanguine in contemplating immediate sales. Every effort will, it is believed, be made by the present broadcasting controlling organization to bring about wide appreciation of radio. The progress will necessarily be slow, and any greatly pronounced sale of American complete radio sets is dependent on its success, although some special parts and lines should react favorably to pushing at this time. Radio achievements and radio evolution are advancing in such strides in America and Europe, and the intervals between new and proved accomplishments are so short that sales activity in radio-receiving sets has been somewhat retarded. The cautious individual purchaser tells the dealer he will wait until he can purchase a set that will not become a relic within a couple of years. Then, too, the unsettled condition in broadcasting circles prevailing for some time detrimentally influenced the market. The market is one which should be closely watched for any developments that might indicate an upward trend in sales possibilities. The key to the situation, it is believed, lies with the agricultural populace, and upon their demand for radio entertainment rests the immediate future of radio-equipment merchandising in South Africa.

TELEPHONES AND TELEGRAPH

TELEPHONES

There are more than 5 telephones per 100 European persons in South Africa, and the system is developing steadily, extending to all the principal cities of the Union. It is Government owned and is

administered by the Department of Posts and Telegraphs. At the end of the year 1928–29 there were 66,056 subscribers in South Africa and 5,390 public call offices, as compared with 58,183 and 5,046, respectively, at the end of the year 1926–27. The largest exchange system is located at Johannesburg, where there are about 14,000 subscribers' lines and 550 public call offices. According to the latest Annual Report (1928–29) of the Postmaster General for South Africa there has been evidenced a continuous demand for the extension of telephone services throughout the country, applications from rural districts in particular being received.

FARM LINES

Of the 154,375,818 "local" calls listed in the year 1928–29, subscribers' calls comprised 138,543,707, farm-line calls 7,379,544, and call-office calls 8,452,567. In 1924 the farm telephone rates were substantially reduced, with the result that there has been a material development in that field; since that time the Government has built 1,435 farm lines, representing 20,556 miles of construction, to serve 9,959 farmers. During the financial year 1928–29 there were constructed 3,105 miles of farmers' telephone lines to serve 1,324 farmers, and 20 new telephone exchanges were established to meet development in the rural areas. In that year the number of farmers connected had reached 12,180, as compared with 9,466 in the year 1926–27; and there were 24,976 miles of farm lines, as compared with 18,812 in the earlier year.

The following extract from the official report indicates the general movement in telephone-service demands.

> Notwithstanding the large number of farmers' telephones provided during the past five years, the demand for this class of service continues to be very great and much work remains to be done to meet outstanding applications, particularly in the Orange Free State, the eastern portion of the Cape Province, and the Transvaal. The department is doing everything possible with the funds at its disposal, to overtake the arrears of construction and to place itself in a position eventually to meet all applications with the minimum of delay; but it will be understood that the intensive farm-line development which has taken place in the Union during the past five years, no less than the general commercial and industrial progress of the country, has called for heavy expenditure on the expansion of the trunk and telegraph systems and on telephone-exchange equipment, both outdoor and indoor, and that the pressing requirements under these heads have necessarily limited the capital outlay possible on farm-line development proper.

AUTOMATIC INSTALLATIONS

The automatic type of telephone is being installed in several towns after a period of developing popularity suddenly interrupted by prohibitive restrictions by the Government about two years ago—since raised. Automatic exchanges have been installed in Durban, Cape Town, Port Elizabeth, Pietermaritzburg, East London, and Johannesburg, but not to the extent of completely displacing the manual exchanges. Of the cities mentioned, Durban, Port Elizabeth, and Pietermaritzburg have automatic service on a relatively large scale. British installations are well represented in South Africa, as Siemens Bros. & Co. (Ltd.), London, have been very active in promoting interest in their No. 16 systems; the Standard Telephone & Cable Co.'s products also are sold. There are a variety of systems in use, with both power-driven and step-by-step systems represented.

Although the extension of the automatic system to other centers is expected, any expenditure by the Government will for some time to come be concentrated on the larger towns, with possibly a few of the smaller market towns that form the center of an agricultural district obtaining a small simple type for day and night service. Trunk-line communication has been established for about 500 miles, with long-distance service between Cape Town, Johannesburg, Pretoria, and Durban.

As a means of insuring efficient control. the Railway Administration has introduced an extensive system of improved telephone communication between depot station masters and the stations in the districts under their control, between system officers and the depots under their control, and between central control at Johannesburg and important centers in the Union. For that purpose, an original expenditure of £205,610 was authorized, of which some £114,243 had been spent by March 31, 1929. Aside from the establishment of verbal communication between important centers and the erection of other new telephone routes, a full automatic telephone exchange has been ordered for Cape Town and a similar installation is to be provided at Durban. Small self-contained automatic exchanges will shortly be installed at Kimberley, Naaupoort, and elsewhere.

TELEGRAPH

The telegraph system is also owned and operated by the Union Government and the country is very well served with an extensive network of lines. The latest official figures (1928–29) show that there are 31,943 miles of telegraph wires connecting 2,955 stations. The Department of Posts and Telegraphs announces that the policy of applying mechanical means of operation to the busier circuits is being pursued, and in this connection a program has been drawn up that will be carried out as expeditiously as possible. The proposals contemplate the retention of Creed apparatus on main lines terminating at Bloemfontein. That station will then be in a position to relieve congestion between any two major offices by making up an additional line between the points concerned, or by the transfer of Creed tape.

SIGNALS AND ALARMS

Railway signals.—A comprehensive program of improvements in existing signal systems on the South African railways has been in process for several years, and in the fiscal year ended March 31, 1929, a sum of about $215,000 was approved for expenditure along such lines. Standard installations were provided at many main-line stations, and alterations or additions to existing installations were effected at a number of others.

The final installation of electrical automatic and semiautomatic day color-light signaling between Cape Town and Wynberg, a distance of 8¼ miles, was completed and brought into operation on February 3, 1929. The installation was designed for dealing with the intensive train service provided for under electrification. Under the mechanical system of signaling it was not possible to provide for an augmented train service, as the block sections were too long for

the short intervals between trains during peak periods; but, equipped with a complete system of track circuiting and modern devices by which the signals displayed are automatically controlled by the trains, it affords, it is stated in the general manager's report recently made public, increased safeguards in maintaining the necessary space interval between following trains, as well as resulting in substantial economies in operating expenditures. Altogether, 118 color-light signals have been installed in place of the 135 mechanical semaphore signals formerly in use. The color-light signals are so spaced that, although the scheme was intended to provide for a 2-minute interval between trains, it is actually possible to maintain a 1½-minute schedule.

An installation of electric-power signaling and color-light signals, somewhat on similar lines to that at Cape Town, is provided for in the new station scheme at Johannesburg, tenders for which have already been accepted. Although color-light signals will be employed, the indications given by them will be similar to those displayed by the semaphore signals used in the Witwatersrand area, so as to preserve uniformity of aspects in that area.

Fire alarms.—Fire-alarm systems are installed only in the large cities and operate along the same lines as in the United States, but with considerably fewer alarm stations installed. A well-known American fire protective system is popular.

Only a few burglar alarms are installed, as the plentiful supply of cheap native watchmen seems to fill the need for nighttime protection of banks, stores, etc.

Traffic signals.—The application of mechanical control to vehicular traffic has for some time been advocated in South Africa, but only a few of the larger cities have established automatic signal systems; of this group, only Johannesburg, where traffic problems are most acute, has developed the system to any degree. The city officials were impressed with the success of electric-signal systems in the United States, and for the past 18 months experimental installations have been in operation.

The success of the original sets resulted in the placing of additional orders with the original supplier, which, though a British manufacturing firm, is rumored to have secured the system from American affiliations. The firm was recently awarded a contract to supply equipment, as follows:

	Amount
Center-pole signals, 9 at £101 10s. each	£913 10s.
Side-pole signals, 11 at £141 5s. each	1,553 15s.
Two-way side signals, 1 set at £116 10s. each	116 10s.
Total	2,583 15s.

Cape Town has not made the same progress, nor has Durban, but it is anticipated that in Johannesburg alone over 100 signals will be in operation before long. It is estimated that each signal in Johannesburg costs about £50 ($242.50) a year to operate.

IMPORTS

Both telephone and telegraph equipment is generally constructed according to the British standard, and tenders are usually drawn up on the basis of the British Government specifications. This prefer-

ence is reflected in the official import statistics, which show that the United Kingdom is the leading supplier. These statistics do not show telephone and telegraph materials separately, but include both under the classification Telegraph and Telephone Materials and Instruments.

The following table will show the South African imports of items coming under that classification for the period 1925–1928:

SOUTH AFRICAN IMPORTS OF TELEPHONE AND TELEGRAPH MATERIALS AND INSTRUMENTS, BY VALUE

Country of origin	1925	1926	1927	1928
United Kingdom	£16,239	£41,016	£20,781	£29,913
Belgium	1,489	3,125	3,656	3,901
Germany	7,608	9,853	5,288	4,038
Sweden	2,037	3,710	4,709	6,909
United States	6,246	3,965	6,194	6,292
Other	505	534	839	1,216
Total	34,124	62,203	41,467	52,269

Four countries—the United Kingdom, Germany, the United States, and Sweden—are the principal sources of supply, with the United Kingdom accounting for about 56 per cent of the total annual value of imports. Coin-operated telephone systems prevail in public stations; for office and home use the hand-set instruments with cradle rests are most popular. Sweden supplies a large number of these sets, and the firm of L. M. Ericsson & Co., of Stockholm, has been very successful in obtaining a share of the trade.

ELECTRIC LIGHTING

DOMESTIC

Domestic lighting in South Africa shows definite need of improvement, and the application of scientific as well as artistic influences is necessary before there is any approach to average conditions in the United States. There is only a limited appreciation of attractive fixtures, and most wired residences are deficient in floor-plug outlets. There is, however, a slight improvement in demand for modern lighting fixtures, since the better type of apartments are being erected, but there are still in evidence a large number of new installations of old-model fixtures. The simple wire drop or those equipped with weighted-procelain cord adjustor and a simple opal conical shade are the most popular suspended types and are common to most residences and offices. Reflected or semidirect lighting is rare, even in office buildings. Floor lamps are becoming more popular, but the small range of models, as well as the relatively high range of prices, has done a great deal to retard installations. Fancy bridge lamps and ornate floor lamps in general are more popular than the simple, plain varieties.

FIXTURES

There is, it is reported, a rather definite attitude on the part of South African architects to practice economy at the expense of the lighting fixtures. One instance illustrates this point: A large and

impressive religious edifice, costing considerable money, has just been completed. After long consideration, the architects in charge decided to construct their own lighting fixtures rather than purchase proved attractive American fixtures that were placed before them by an illumination engineer. As a result, a hybrid sort of fixture has been devised which is manifestly not in keeping with the character of the building or its other furnishings, and it is only a matter of time until a complete new installation will have to be made.

This outstanding problem in the electric-light field is to be attacked at once when a service bureau known as "Saela" is completely established and starts functioning. This organization, to be established for the purpose of encouraging better and more scientific lighting in homes, shops, and factories, is fostered by the South African Association of Lamp Manufacturers, a cooperative group of competitors operating in the Union. Offices and demonstration rooms have been engaged, where free information will be dispensed, lectures and demonstrations given, and general work of educating the public in proper lighting and the use of various appliances carried on.

The work will be in charge of an illumination and electrical engineer, who has had several years of experience in England along similar lines. This project has been under discussion by the association for several years, and the work will be under direction of the executive committee.

COMMERCIAL LIGHTING

Commercial illumination has made somewhat better progress than domestic lighting, but considerable development is yet to be experienced before a high standard is reached. A number of the newly erected commercial premises have been equipped with indirect or reflected lighting systems and some advance in efficient illumination has been noted, but on the whole the situation can not be regarded as satisfactory.

WINDOW LIGHTING

Store-window lighting has made some advance, and "hidden" illumination is employed by the principal department and furnishing stores of the larger cities, but there are a larger number of establshments using ordinary drops with fluted and ribbed shades or simple bracket lights. "Window shopping" is a common practice in South Africa, consequently the stores, realizing the influence of visual salesmanship, are inclined to have their windows lighted, especially on Saturday nights when country folk flock to the towns and cities to make their purchases. Window dressing is not, however, very well done from the viewpoint of the American standard, as it is often the practice to place entirely too many articles in a limited space, with the result that overcrowding is evident. A few of the electric-flash types of advertising window displays have been installed, but their use is exceptional. There has also been some concern over the proper scale of charges for current used for store-window lighting.

In general, shop-window lighting is not especially favored by municipal undertakings, for the demand occurs during the peak period and in most instances windows are lit up only one or two evenings a week. No other class of supply is so restricted or costs more to

deliver, and in cities where there is some demand for this service efforts are being made to encourage "every evening" lighting. Attractive rates are being used in the solution of this problem.

Pretoria has adopted the following plan which, it is understood, has increased the revenue from window lighting in three years from $1,500 to $15,000:

> The consumer makes a contract with the municipality to take a supply for 3, 4, or 5 hours per evening for every day in the year, Sunday being optional, and by doing so gets the current at reduced rates; the rates depend on the hours of demand. An automatic time switch governing the window lighting is installed in the shop and is controlled and maintained by the municipality; this device is set to switch the lights on or off automatically at predetermined times. The consumer enters into a yearly contract for the supply of current for 3 or more hours per night for 313 days in the year, on the following terms:
>
> 1. The council provides, controls, and maintains an automatic time switch, which remains the property of the council.
> 2. The consumer pays a monthly rental of 5s. (2s. 6d. for small consumers) for the use of the time switch.
> 3. The current is supplied at the following rates per kilowatt-hour: First hour's consumption per night, 5d.; second hour's consumption per night, 3d.; third and subsequent hour's consumption, 1d.
>
> On this basis the average cost of consumption per kilowatt-hour would be: 3 hours per day, 3d.; 4 hours per day, 2½d.; 5 hours per day, 2¼d.; 6 hours per day, 2d.
>
> The consumer is given the benefit of changing his time and hours of supply on March 15 and September 15 of each year, provided the hours of supply are not less than three per night.

A further extension of the plan to other cities is likely and should increase the interest of commercial houses in window lighting.

ELECTRIC SIGNS

The use of electric signs is not widespread, and relatively few are in operation in Johannesburg, Cape Town, and Durban, the three largest cities of the Union. Most of the cities have in no way encouraged this class of load through favorable rates; in fact, municipal authorities at some points are pronounced in their antipathy toward the erection of electric signs.

The sale and installation of large electric signs is greatly retarded by the initial and operating costs, by the lack of population concentration in large cities, and by the scarcity of industrial organizations of any size in the Union. Price is really the controlling factor. There has been some slight tendency on the part of importers to bring in component parts of signs, such as illuminated letters, and to add to them such locally made parts as may be necessary to construct signs. These are usually of small size and in many instances are placed in small towns instead of the larger cities.

On the whole, it may be stated that the cities of South Africa are underilluminated.

INDUSTRIAL LIGHTING

With the development of industries there has come an increased demand for factory lighting, but seldom is a scientific analysis or installation effected. Wiring is completed with the idea of allowing direct illumination at regular intervals, and as a rule industrial lighting is poor. It should be remembered that, due to an abundance of natural light and the infrequency of dark, cloudy days, the use of artificial light is restricted; illumination problems therefore do not look so large in this country as in some others. Then, too, industrial practices in general are not of the advanced type save in a few exceptional instances, though conditions in that field are improving. Flood lighting by the railways and harbors at certain points has been installed, last year the administration introducing its most advanced system of flood lighting at Witbank, an important center near Johannesburg. Electric lighting was installed at 24 additional stations during the year.

STREET LIGHTING

The use of electricity for street lighting has become increasingly popular, and most of the towns of South Africa where lighting current is available have installed street lights. Many make very limited use of them, especially in the small towns.

LIGHTING SUPPLIES

SOCKETS AND PLUGS

It has already been noted that the bayonet socket is, for household purposes, virtually standard. Most of the sockets sold are of the keyless types, supplied chiefly by British manufacturers, though during the war Japanese goods were sold to a very great extent. Lack of consistently good quality is understood to have driven Japanese electrical goods from the market for a long time. Some continental bayonet sockets also are sold, but primarily on a price basis. Screw sockets are a little more popular than heretofore, but are confined in their use chiefly to the mines, trains, and commercial institutions. Where security of contact is essential and efforts are made to prevent the appropriation of company bulbs by employees for their own domestic use, Edison screw sockets are generally installed. The few electric signs in use generally employ screw sockets, but the wide household market is predominantly committed to the bayonet socket.

In connection with domestic electrical appliances, it should be noted that the British bayonet light socket is generally used throughout the Union and the Edison screw socket is seldom found.

Floor and wall plugs are not uniform; though made to fit appliance plugs of specific types, they usually accommodate those employing two round tines. Flat tines are not so popular as the round variety; the latter are stocked in several diameters, lengths, and spacings.

SWITCHES, FUSES, AND CONDUITS

The ordinary brass-covered tumbler switch of 5 amperes, 250-volt, is used for domestic lighting. American flush-type push-button switches are seldom installed and are restricted by being more expensive than the well-known tumbler types. For years British tumbler switches have been the most popular, but recently identical models of German manufacture have made inroads into the British position through price influences; new building is taking sizeable quantities of the German product. The American switches are seldom seen. It should be remembered that the domestic lighting supply in South Africa is mostly 220 volts.

The open-links fuse with a porcelain holder, provided with contact at each end to be inserted into spring clips in the fuse box, is the most popular type installed.

Wiring conduit is comparable to that used in the United States; enamel tubes and fittings are widely used. (For requirements, see Municipal wiring regulations, (p. 29).)

LAMPS (BULBS)

Small-candlepower gas-filled lamps are relatively more popular in South Africa than in the United States. For domestic use a vacuum 50-candlepower (60 watts) lamp is purchased. As already noted, these lamps are mostly of the bayonet-base type.

COMPETITION

A number of makes of lamps are on sale, and at one time competition was so keen that so-called "cutthroat" methods were not uncommon, but there exists at this time an Electric Lamp Association which exercises a better influence over merchandising practices. This association contains among its members virtually all the large lamp manufacturers selling in South Africa; only two or three so-called "outlaws" operate in opposition, and their total turnover is very small. Competition is restricted to features other than prices, as these are uniform for the association members; dependence for sales advantage is obtained through advertising channels. Even that channel carries certain restrictions; for example, reference to other competitors, superlative or comparative performance claims, and similar features are prohibited. Therefore, efforts to establish the trade name in the mind of the consumer is stressed in advertising. Government and municipal tenders are divided among the members, as quotations are uniform.

American-made lamps secure a fair share of the business. Under the classification Lamps, other electric (globes, bulbs, etc.), import values indicate rather accurately the total business done and reveal the principal sources of supply, as no manufacturing is carried on in South Africa.

The United Kingdom easily leads in the trade year after year, with the Netherlands consistently second. In 1928 the United Kingdom accounted for 38 per cent of the trade by value and the Netherlands for 24 per cent, followed in order by Germany with 15 per cent and the United States with 9 per cent.

The most popular makes of lamps follow to some degree the import trend and include the following, in the order named: Philips (Netherlands), Osram (British), American (United States), Tungsram and Ferrowatt (each Hungary).

IMPORTS

In the following table, covering the period 1925–1928, it will be noted that the import trade in lamps has consistently decreased annually.

South American Imports of "Other"[1] Electric Lamps (Globes, Bulbs, Etc.) by Value

Country of origin	1925	1926	1927	1928
United Kingdom	£89,794	£79,951	£59,134	£49,731
Austria	4,134	6,112	10,737	9,874
Germany	13,937	13,292	15,014	19,449
Netherlands	33,033	30,736	30,157	31,980
United States	16,143	8,174	10,939	11,483
Other	4,503	2,752	9,673	9,293
Total	161,544	141,017	135,654	131,810

[1] Not including flash lights.

RETAIL CHANNELS AND PRICES

Not only are electric-light bulbs sold through the recognized retail electrical stores but the bazaars (corresponding to the 5-and-10-cent chain system) are handling electrical fixtures, tumbler switches, plugs, etc., of a simple character, including lamps. The uniform retail price of lamps sold through these channels is 1s. ($0.24) each for vacuum types of the usual 40-watt 200 to 220 volts; their origin is almost exclusively continental. There is an increasing amount of trade in various lines passing through these outlets, which are becoming more widespread and are to be found in the principal cities of the Union. They purchase entirely on a price basis and handle branded goods only when there is an insistent demand for them.

FLOOD LIGHTING

Flood lighting for advertising purposes is seldom used, and the limited instances in which commercial buildings are lighted in this fashion are confined to three or four of the larger commercial centers. Such use of electric lighting is as much retarded as the large electric-sign business. The mines are well equipped with high-powered lamps for illuminating the surface working areas, and in the Government alluvial diamond fields in Namaqualand a high tower has been erected which illuminates the fields over a considerable area to prevent any illegal operations during the night. This lighting system is so powerful and so near the sea that maritime notices of its existence have been issued by the Government.

Flood lighting for airdromes has made no progress as yet. No night-flying schedules are maintained, and on the occasions when lighted landing fields have been necessitated, flare and gasoline torches have been used. Aviation is progressing with moderate speed. Large passenger planes are now being placed in operation, and the Imperial Airways Cape-to-Cairo project, expected to be opened within two years, is certain to stimulate aeronautic development with an accompanying use of lighted fields for night flying. Harbor piers at Cape Town and Durban are equipped for nighttime operations, and railway yards at important points have in some instances been equipped with lighting facilities.

FLASH LIGHTS

The use of flash lights in South Africa has been progressing for some years, and to-day there is a considerable sale of both cases and batteries. Motorists usually carry them in preference to more complicated inspection lamps, and bicyclists, of whom there are a large number in the Union, are favoring the use of flash lights to some extent. The railways consume a quantity for the use of employees, and homes of the better class are making them a part of their equipment. Municipalities furnish flash lights to their meter inspectors and readers, and farmers in the country also are using them.

There is no local production of cases, therefore the annual consumption in South Africa is indicated by the following table of imports for the period 1925–1928, showing the trend of the trade and the principal oversea sources of supply, by values; no quantity figures are available.

SOUTH AFRICAN IMPORTS OF ELECTRIC HAND LAMPS (FLASH LIGHTS), BY VALUE

Country of origin	1925	1926	1927	1928
United Kingdom	£1,740	£2,451	£2,413	£2,143
Germany	2,723	2,375	4,342	4,300
France	51	116	114	158
United States	8,017	11,144	12,991	14,156
Other	1,424	285	273	220
Total	13,955	16,371	20,133	20,977

It will be noted that the United States holds a commanding lead. This trade has been built up considerably during the past two or three years, and in 1928 fully 67 per cent of the total value of flash lights was accounted for by American products. The United Kingdom and Germany are important competitors, consistently appearing as second or third in value of trade. German flash lights have been a little more prominent lately, and a Swedish product with a long-lasting battery has made its appearance. The tubular 3-cell 1¼-inch size is the most popular model, and heavier stocks of that class are carried on the shelves of retailers. Some of the long 5-celled variety are meeting with a limited popularity, and a few "three color" models have been sold, chiefly on the novelty basis. Relatively few flat types are sold, though the bazaars stock them in fairly good quantities, mostly of the cheap continental class. In the popular tubular models, black composition finishes are more in demand than the bright metal cases.

BATTERIES

FLASH-LIGHT BATTERIES

American flash-light batteries are standard, completely dominating the market and meeting the entire approval of the consuming public. Another fairly satisfactory battery is the Danish Helogen. Two brands are made locally, the Excelsior and the Comet, but they do not offer any appreciable competition to the American product as their volume of production is relatively insignificant. They do, however, find outlets through the bazaars, where prices are cut very fine. The English Everready and a German battery also are imported into South Africa.

The estimated consumption of flash-light batteries in South Africa is from 350,000 to 400,000, about 90 per cent of which are supplied by one American firm. The success of this firm is due partly to the uniform excellence of its product and partly to the fact that it is represented by one of the most energetic and capable manfacturers' agents in South Africa.

Six months is considered the usual shelf life of a flash-light battery in South Africa. Maximum temperatures are as high as 112° F., with averages around 70°.

Both flash lights and flash-light batteries are merchandised through a wide variety of retail outlets; in fact, they have come to be regarded as anything but a strictly electrical line and are being stocked by almost as many kinds of stores as in the United States. They may be found in electrical-appliance shops, hardware stores, department stores, jewelry and drug stores, garages, and bazaars. They are handled by distributing wholesalers and by large importing retailers, orders being taken by manufacturers' agents who travel through the country.

PRIMARY BATTERIES

Dry cells are far more popular in South Africa than wet cells, although for door-bell work a sizeable number of house owners insist on the wet cell. When the entire class of primary batteries is considered, the United States holds a commanding lead as the principal oversea supplier, accounting in 1928 for 67 per cent of the total value of primary batteries entering South African ports; the United Kingdom stood second, with 21 per cent; and Germany third, with 6 per cent.

The import trade in this class showed marked improvement during the 4-year period 1925–1928, the value of imports increasing from £21,505 to £114,948. The United States share in that trade has followed closely the general development.

The principal sources of supply and their relative importance are shown in the following table:

SOUTH AFRICAN IMPORTS OF PRIMARY BATTERIES, BY VALUE

Country of origin	1925	1926	1927	1928
United Kingdom	£8,323	£10,676	£17,394	£24,219
Denmark	1,550	6,630	6,106	5,485
Germany	3	3,542	4,813	6,934
United States	10,094	31,064	63,265	77,600
Other	1,535	194	4,641	710
Total	21,505	52,106	96,219	114,948

STORAGE BATTERIES

The increased use of automobiles in South Africa has been paralleled by an enlarging sale of batteries for motor vehicles. The trade is controlled chiefly by American products.

An indication of the replacement market may be obtained from the figures of provincial registration for motor cars, busses, and

trucks between 1926 and 1929 (the latter year estimated). In the Cape Province the total number of automobile registrations increased from 38,385 to 67,082; in Natal, from 10,758 to 18,723; in Transvaal, from 25,593 to 48,645; in the Orange Free State, from 11,703 to 19,537.

A notable advance has been made in the quality of service available to purchasers of the leading makes, and to this facility is accredited a fair share of their popularity. Of course, the "original equipment" factor is a very influential one in promoting the sale of replacement parts, and price is also a feature of the trade. Automobile supply houses and garages carry on the bulk of the trade.

Municipal electrical supply stations in the smaller towns of the Union have installed storage batteries in their systems.

The import trade in secondary batteries has witnessed a healthy development in postwar days, its value increasing from £38,481 in 1925 to £81,779 in 1928. The dominance of the American product is clearly shown by the fact that in 1928 over 61 per cent of these imports originated in the United States, as compared with 26 per cent for the United Kingdom and 9 per cent for Germany—the nearest rivals.

TRAIN-LIGHTING EQUIPMENT

All principal trains of the Union are illuminated by electric lights. The current is supplied by accumulators operating as axle-driven sets. Periodically the railways ask for tenders, which call for 112 ampere-hour as well as 150 ampere-hour sets, with the following specifications effective:

1. Capacity at normal rates, for the respective sets, 112 ampere-hours and 150 ampere-hours.
2. Normal charging rate, for same, 22.5 amperes for 7 hours and 30 amperes for 7 hours.
3. Normal discharge rate, for same, 14 amperes for 8 hours and 18.75 amperes for 8 hours.
4. Average discharge voltage per cell, for same, 1.24 and 1.24.
5. The cells are to be delivered fully assembled in crates of six cells each, complete with cell connections and dry electrolyte mixture.
6. The maximum overall dimensions of the crates must not exceed: Length, 30 inches; height, 19 inches; and width, 9 inches.
7. The elements must be so placed in the containers that they will admit of space for solution between the container sides and the elements, and this space must not be less than ½ inch on each side of the elements.
8. The normal level of the electrolyte must not be less than 2¼ inches above the plates.
9. The elements must be so fixed in the containers that the former will be absolutely rigid under the usual conditions incidental to train working, and the edges of the elements must also fit into hard-rubber insulating ladders placed between the elements and containers on both sides and bottoms.
10. The hard-rubber separator pins or insulators must be so designed and fixed that they will be prevented from working up between the elements when in service.
11. The connecting poles must be tapered at the connecting point, and such tapered portion must not exceed ⅝ inch in length (excluding threaded part) and the diameter must be $\frac{13}{16}$ inch at base of taper, reducing to ⅜ inch at top.
12. In addition to any manufacturer's identification marks, which may be stamped on the lids of containers, the rated capacity of each cell must be shown thereon. Also the letters TL. "S.A.R.–S.A.S." must be stamped on the lids of containers.
13. The cell crates must be provided with a loose cover of wood, which will protect the tops of the cells and prevent excessive accumulation of dust thereon.

During the year ended March 31, 1929, the total expenditure on the maintenance of train lighting amounted to £82,217. The average cost per equipped coach was £30 14s. 7d., which is the lowest figure for 8 years. The number of lamps replaced in coaches was 88,932.

A number of imported accumulators are competing for the railway business, among the more prominent being: American (United States), Stone (British), Batteries, Ltd. (British), Worsnup Co. (British), Nife (Swedish, operating through British affiliations), Acklum (German), and A. E. G. (German).

Successful tenderers recently have quoted on the 150-ampere-hour sets at £17 5s. to £17 15s. per tray free-on-rail in bond Union ports; several tenders on the 112-ampere-hour sets ranged from £15 10s. to £16 4s.

FARM-LIGHTING SETS

As previously implied, the use of electricity on the farms of South Africa is decidedly limited; with the exception of districts near to some town where current is available and from which distribution is extended to rural users, dependence is placed entirely on home-lighting sets. There are no authoritative statistics showing either the number of these sets in operation or the number imported annually, but since activity in that field has been more accentuated in the postwar years and since the average yearly sales have been limited, it is accepted that the country is not oversold.

COMPETITION, PRICES, AND PREFERENCES

American sets, since their introduction, have been the most popular of several competing makes and continue to dominate the market in spite of strong efforts on the part of German and English manufacturers. The United States, leading with 61 per cent of the total value of South African imports in 1928, is followed by the United Kingdom with 30 per cent, and Germany with 9 per cent, these three countries supplying the market. Two British sets have made some headway against American sets, but their progress is not consistent.

Prices vary, but it is believed that American sets are cheaper than British though usually higher than German sets. One distributor states that he will deliver and install a complete set for an 8-room house for £175. German sets have been offered at prices considerably lower than leading American sets, but the reputable service record already attached to American lines has been effective in restricting the loss of sale to German products. There is, however, some inclination on the part of purchasers to respond to favorable price quotations, and keener competition is anticipated.

Distributors of competing plants indicate that the most popular types are the compact, automatic or semiautomatic, designed for kerosene operation, equipped with magneto, 32-volt, 0.6 and 1.2 kilowatts, 20 to 40 lights, and battery of modern rating. There has been some criticism of American sets for not having Tudor batteries and also on the grounds of American systems of rating batteries, but this is not widespread. Ten-hour charge rates are popular. The rural purchaser invariably demands that the engine have a belt pulley, to be used in driving small-power working appliances or pumping outfits.

IMPORTS

Some indication of the commanding position occupied by American lighting sets is furnished by the following import statistics for the period 1925–1928.

SOUTH AFRICAN IMPORTS OF ELECTRIC LIGHTING SETS

Country of origin	1925	1926	1927	1928
United States	£15,754	£17,629	£12,604	£14,462
United Kingdom	2,262	7,779	4,032	7,083
Germany	1,446	20	230	2,146
Other	84	61	99	5
Total	19,546	25,489	16,965	23,696

No quantity figures are available, but it is estimated by one dealer prominent in the trade that an average of 350 to 400 sets come into South Africa annually. This figures seems to be reasonable and to some extent is substantiated by United States export statistics showing 245 sets sent to South Africa during 1927 and 220 sets during 1928.

DISTRIBUTION CHANNELS AND CONDITIONS

Distribution of lighting sets is usually placed in the hands of so-called engineering houses or agricultural implement houses; the latter have the better contact for prospective purchasers, except where engineering houses also carry agricultural lines, which occurs in some instances in this market of limited scope. The set reported to have the widest sale is distributed through prominent engineering houses located in the chief commercial centers.

It is important that well-placed service facilities be available to purchasers and that the distributors be capable of furnishing competent assistance on short notice. Their financial resources should also be able to stand the necessary installment purchases on which basis virtually all sets are sold. As sales are promoted chiefly in rural and agricultural areas, the sales curve for each district will usually follow the economic trend of the farming community.

DISTRIBUTION CENTERS FOR ELECTRICAL EQUIPMENT

The larger cities of the Union serve as distribution points for the important districts and also as retail outlets that supply a considerable trading area immediately surrounding the city. From all the cities named below the most productive sales areas can be covered with the minimum of effort. Stocks can be carried in bond at the nearest port, and distribution can usually be administered from Johannesburg.

JOHANNESBURG

Johannesburg is recognized as the commercial hub of South Africa and is easily the largest business center of the Union. It is constantly growing, but new construction of houses and apartments has just about reached the normal demand. It is the logical distribution center for electrical appliances and equipment for supplying the

needs of the Reef towns and the Transvaal in general. The Victoria Falls & Transvaal Power Co. (Ltd.), operating from headquarters in Johannesburg, is supplying most of the mines with current as well as selling bulk supplies to a number of towns within the Reef area extending over a territory about 70 miles long and 30 miles wide.

The city of Johannesburg, though a struggling mining camp some 40 years ago, is to-day a modern city in the center of the world's greatest gold-producing area, possessing an extensive electric lighting system, an excellent water supply, and a street-car system which, with radiating bus lines, supplies the transportation services for the population. Excellent railway connections with the other Provinces and centers enhance its position as a distribution point. Both Durban and Lourenço Marques (Mozambique) are used as entry ports for goods destined for Johannesburg.

CAPE TOWN AND PORT ELIZABETH

Cape Town, the second largest city, is an important port through which merchandise of a considerable value passes. Diamonds and gold are exported through this city; it is the chief mail port for inland sections; it supports an industrial community and acts as a distribution point for trade extending into the relatively well-off agricultural districts of the western Province. Modern office buildings and commercial establishments, as well as dwellings of good construction and design, are common. Though somewhat more conservative in its living habits than Johannesburg, there has been, under the direction of a very active municipal electrical engineer, a notable increase in appreciation of better lighting fixtures, domestic appliances, etc.

Port Elizabeth, another important port, is a well-used center of trade and acts as a shipping and entry port for Rhodesian points, as well as being utilized for quick shipments of goods to Johannesburg. It is a distribution point for the eastern Cape Province, Basutoland, and parts of the Orange Free State; it is the center of the wool and hides trade; is rapidly developing as an industrial town, two automobile assembly plants as well as other factories being located there; it maintains a good street-car and lighting system and is used as a basis of operation by a number of wholesale houses. Building and construction has been going ahead rapidly of late, and in 1929 the value of building plans passed by the city council exceeded by far any previous year's total. New buildings have grown up in all sections of the town, and construction firms have been busy. There were completed during the year 304 dwellings, valued at £179,225, and, exclusive of dwellings, 176 plans for new buildings were passed.

DURBAN AND BLOEMFONTEIN

Durban, one of the busiest ports handling a large tonnage, is, perhaps, the furthest advanced city of the Union from an electrical standpoint. House current is cheap, and greater progress has been made in domestic installations. A residential section that has been "sold" on the advantage of domestic uses of electric current in well-built homes, a modern business section, and a developing industrial area all contribute to the local use of electrical devices. The city acts

as the chief distribution center for all Natal, utilizing Pietermaritzburg, 70 miles inland, as a subcenter. It is connected by rail with the other large centers and is only about 500 miles from Johannesburg.

Bloemfontein, the capital and largest city of the Orange Free State, is the center of the electrical trade for that Province, which is distinctly agricultural in character. The city is located on the main railway line between Port Elizabeth and Johannesburg, about 450 miles from the former. It has lately installed a larger power plant, and efforts are being made to encourage a wider use of domestic current.

TRANSPORTATION

OCEAN FREIGHT SERVICES

The most frequent steamer service between England and South African ports is in the hands of the Union Castle Steam Ship Co., which runs mail vessels from Southampton to Cape Town weekly on a 17-day schedule. In addition, an intermediate steamer is run on a somewhat slower schedule. From Cape Town vessels proceed to other South African ports of size. Other services from England also put in at South African ports, and German and Netherlands lines carry freight up both the east and the west coasts to English and continental ports. Italian combination passenger-and-cargo ships are carrying a small amount of the trade, but on the whole the bulk of cargo is carried in British bottoms.

Ocean connections between South Africa and the United States have improved considerably, and at present monthly sailings of the American-South African Line offer a fairly frequent service between Atlantic seaboard ports and South African ports. These vessels take about one month to cover the distance between United States ports and Cape Town, the first South African port entered. There are also a number of British lines, such as the Union Castle, the Clan, the Prince, and others, which supplement with other sailings. From the west coast of the United States the United States Dispatch Line has recently inaugurated a service to South Africa to meet the needs of the west-coast producers.

RAILWAY AND HIGHWAY TRAFFIC

Virtually all inland traffic in electrical goods is handled by the railways and, as a rule, rail freight rates are high. The railways are fairly extensive and serve well the hinterland of the various ports. They are Government owned and operated. Long-distance auto-truck hauling is seldom encountered, for the highway system of the country on the whole is not well developed. The railways and a few independents have established motor road services that reach rural sections not touched by the railwav lines, and light traffic is handled for such points. Heavy hauling from railway points is usually accomplished by ox wagons, carrying 5 or 6 tons and drawn by 12 to 16 oxen—a slow but cheap form of transportation.

Passenger traffic moves in comfortable coaches; though considerably faster than freight traffic, it still is slower than in the United States or England. The fastest trains between Johannesburg and Cape Town, a distance of 956 miles, take 28 hours for the journey.

COMMERCIAL MEDIUMS

BANKING FACILITIES

There are six joint-stock banks in the Union, but banking operations are principally in the hands of three main banks or systems—the Standard Bank of South Africa, Barclay's Bank (Colonial, Dominion & Overseas), and the Netherlands Bank of South Africa. Others of less importance are the Colonial Banking & Trust Co., at Johannesburg; the Stellenbosch Bank, at Stellenbosch; and the Public Liberal Bank, at Cape Town. The first two are very strong and operate through branches in many of the towns of the Union and contiguous territory; though administered to a considerable extent by local directorates, they are really controlled by head offices in London. Banking practice is, therefore, predominantly British in character, and services are comparatively expensive. Branch banking has made considerable progress, the Standard Bank having some 230 branches in the Union, Barclay's some 242, the Netherlands 16, the Colonial Banking & Trust 7, the Stellenbosch 1, and the Public Liberal 1.

In 1923 there was established the South African Reserve Bank, which exercises some control over banking operations in the Union. It is obliged to fix and publish from time to time the rate at which it will discount the various classes of bills, the latest announcement being August 17, 1929, fixing the following rates: 6 per cent for first-class commercial bills of not more than 90 days currency; and 5½ per cent for first-class agricultural bills, with a maturity exceeding 90 days but not exceeding six months.

The joint-stock banks deal in the same class of business as the Reserve Bank and at the same rates. On first-class secured overdrafts and unsecured overdrafts of undoubted clients their rate is 6½ to 8½ per cent.

CURRENCY, WEIGHTS, AND MEASURES

The English monetary system is in use generally. The currently used coins are the penny, the threepence ("tickey"), the sixpence, the florin (2s.), and the half-crown (2s. 6d.); the popular paper money in use consists of the 10s., the £1. and the £5 notes.

English weights and measures also are used throughout the Dominion, with the exception of the long ton of 2,240 pounds, for which the popular substitute is the short ton of 2,000 pounds.

LANGUAGE AND CORRESPONDENCE

Although South Africa is officially a bi-lingual country, Government publications being issued in both English and Afrikaans, the commercial language of the country is English. It is true that certain Government officials prefer to discuss matters in Afrikaans, and certain rural or semirural districts are rated as Afrikaans-speaking sections, but English is generally understood and Afrikaans is not essential to the prosecution of sales. More than 75 per cent of the European population over seven years old speak English, according to census returns, and it is believed that the actual percentage for commercial persons is much higher.

Both correspondence and direct-mail-advertising matter may be composed in English. Parcel-post operations between the United States and South Africa have aided considerably in establishing American small lines on the market, but a speeding up of the service and assurance as to uniform consumed time in delivery is needed.

CONCLUSION

In conclusion it may be pointed out that the extension of sales of electrical plant machinery, equipment, and supplies is dependent chiefly on a continued reduction in the operating costs of stations, the delivery of current to consumers at lower rates, and the wider education of the public in the uses for electricity.

On the first item some progress has been made, and electricity supply in South Africa has passed the problem stage; but there still remains the instinct to install plant equipment on a price basis rather than on performance, thereby failing to obtain the maximum economies in production.

The second factor is, of course, closely interrelated with production costs, the efficiency of boilers, prime movers, and other essential equipment, as the lower the rate the more freely current is used. It is estimated that if current can be delivered to local domestic users at less than 1 penny per kilowatt-hour, the use of domestic appliances would then become an economic possibility.

The recognition of better education of the public as an essential to wider use of electricity is evidenced by the establishment of educational and demonstration bureaus, an emphasis on municipal commercial offices for selling electrical appliances, and the growth of assisted-payment schemes by South African cities.

Tramway lines can hardly be expected to increase, as the tendency to use motor busses is becoming more pronounced; likewise, there appears to be little hope for an appreciable increase in electrification of the railways, with the possible exception that the original Natal scheme may be completed in time. It is generally held that railway electrification has so far not justified itself financially.

BUREAU PUBLICATIONS

The following publications of the United States Bureau of Foreign and Domestic Commerce are of value to the American exporter of electrical equipment. They may be secured at 10 cents each, from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from the district and cooperative offices of the Bureau of Foreign and Domestic Commerce, established in most of the principal cities of the United States.

Domestic Market Possibilities for Electrical Merchandising Lines. Domestic Commerce Series No. 8.
Central Light and Power Plants in Africa. Trade Information Bulletin No. 423.
Central Light and Power Plants in Australia and New Zealand. Trade Information Bulletin No. 441.
Central Light and Power Plants in the Western Hemisphere. Trade Information Bulletin No. 469.
Electrical Development and Guide to Marketing of Electrical Equipment in Australia. Trade Information Bulletin No. 487.
Electrical Development and Guide to Marketing of Electrical Equipment in Brazil. Trade Information Bulletin No. 496.
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